SEXUAL REPRODUCTION IN FLOWERING PLANTS

FLOWER – A FASCINATING ORGAN OF ANGIOSPERMS

1 Cultivation of flowering and ornamental plants for gardens and for commerce and trade is called:

1.	Horticulture	2.	Plant breeding
3.	Floriculture	4.	Micropropagation

PRE-FERTILISATION: STRUCTURES AND EVENTS

2 Consider the following statements regarding floral primordium:

I:	It is formed at the shoot apical meristem
II:	The development of flowers is dependent on genetics, PGR, and environmental conditions.

Of the two statements:

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect.

3 In a typically complete, bisexual, and hypogynous flower, the arrangement of floral whorls on the thalamus from the outermost to the innermost is:

1.	Calyx, corolla, androecium, and gynoecium
2.	Calyx, corolla, gynoecium, and androecium
3.	Gynoecium, androecium, corolla, and calyx
4.	Androecium, gynoecium, corolla, and calyx

4 Among the terms listed below, those that are not technically correct names for a floral whorl are:

i.	Androecium	ii.	Carpel
iii.	Corolla	iv.	Sepal

1.	i and iv	2.	iii and iv
3.	ii and iv	4.	i and ii

5 Anthers in angiosperms:

I:	are typically located at the tip of the filament of the stamen.
II:	are usually bilobed, each containing pollen sacs called microsporangia.
III:	dehisce, or split open, to release mature pollen.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

6 A typical angiosperm anther is:

1. Bilobed and polythecous
2. Unilobed and monothecous
3. Multilobed and monothecous
4. Bilobed and dithecous

7 All the following regarding a typical angiosperm anther is correct except:

1.	it is bilobed
2.	each lobe has two theca
3.	a transverse groove runs diametrically separating the theca
4.	it is a four-sided (tetragonal) structure consisting of four microsporangia located at the corners, two in each lobe.

8 Consider the given two statements:

Statement I:	A typical angiosperm anther is bilobed with each lobe having two theca, i.e., they are dithecous.
Statement II:	The anther is a four-sided (tetragonal) structure consisting of four microsporangia located at the corners, two in each lobe.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

9 Which of the following would not be true regarding the structure of a typical anther in an angiosperm?

1. Lobes: 2
2. Sides: 4
3. Microsporangia: 4
4. Theca in each lobe: 1

10 In an angiosperm, the structure that develops and becomes a pollen sac is called:

1.	Megasporophyll	2.	Megasporangium
3.	Microsporangium	4.	Microsporophyll

11 A typical microsporangium is generally surrounded by four wall layers where the outer three wall layers perform the function:

I:	of protection of the developing pollen grain
II:	in dehiscence of anther to release the pollen
III:	to nourish the developing pollen grains

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

12 The correct sequence of layers in the wall of an anther from outside to inside is:

1.	Tapetum – Middle Layers – Endothecium – Epidermis
2.	Epidermis – Endothecium – Tapetum – Middle layers
3.	Epidermis – Endothecium – Middle layers – Tapetum
4.	Tapetum – Endothecium – Middle layers – Epidermis

13 Tapetum:

1.	is the outermost layer in the wall of microsporangium
2.	helps in the protection of the pollen grains
3.	helps in dehiscence of anther
4.	has cells that generally have more than one nucleus

14 The cells of which of following layers in the wall of a typical microsporangium possess dense cytoplasm and generally have more than one nucleus?

1.	Epidermis	2.	Middle layers
3.	Endothecium	4.	Tapetum

15 In a microsporangium:

I:	Epidermis and middle layers are protective in function.
II:	Endothecium and tapetum are nutritive in function.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

16 Consider the given two statements:

Assertion(A):	Each cell of the sporogenous tissue in a microsporangium is a potential pollen or microspore mother cell.
Reason(R):	Each cell of the sporogenous tissue in a microsporangium is capable of giving rise to a microspore tetrad.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

17 During microsporogenesis, meiosis occurs in:

1.	Endothecium	2.	Microspore mother cells
3.	Microspore tetrads	4.	Pollen grains

18 Which of the following statements about pollen grains is true?

1.	Pollen grains are male gametophytes enclosed within the pollen sac.
2.	Pollen grains are diploid and generate female gametes.
3.	Pollen grains are produced in the ovule.
4.	Pollen grains undergo mitosis to produce pollen tubes.

19 Consider the given two statements:

Assertion(A):	Pollen exine is preserved in fossil records.
Reason(R):	Pollen exine is composed of highly resistant sporopollenin.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

20 'Germ pore' in pollen in angiosperms:

1.	is a part of pollen intine where sporopollenin is present
2.	is a part of pollen intine where sporopollenin is absent
3.	is a part of pollen exine where sporopollenin is present
4.	is a part of pollen exine where sporopollenin is absent

21 Pollen grain intine:

I: is the inner wall
II: is composed of sporopollenin
III: has prominent apertures

1.	Only **I** is correct	2.	Only **I** and **III** are correct
3.	Only **II** is correct	4.	**I, II, III** are incorrect

22 Consider the given two statements:

Assertion (A):	Pollen exine is extremely hard and can withstand harsh environmental conditions.
Reason (R):	Pollen exine is made of sporopollenin, which is resistant to high temperatures and strong acids and alkalis.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

23 Which of the following is incorrect regarding vegetative cell of pollen grains?

1.	It is the bigger cell in the pollen grain
2.	It has abundant food reserves
3.	It has a large irregularly shaped nucleus
4.	It floats in the cytoplasm of generative cell

24 What is true about the vegetative cell in the pollen tube?

1.	It is smaller than the generative cell
2.	It has an irregular shaped nucleus
3.	It floats in the cytoplasm of the generative cell
4.	It has a dense cytoplasm lacking food reserves

25 Consider the given two statements:

Statement I:	The vegetative cell in a pollen grain is bigger, has an abundant food reserve, and has a large, irregularly shaped nucleus.
Statement II:	The generative cell in a pollen grain is small and floats in the cytoplasm of the vegetative cell.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

26 In about 40 per cent of angiosperms:

1.	pollens are shed at two-celled stage
2.	the generative cell divides mitotically to give rise to the two male gametes before pollen grains are shed
3.	the vegetative cell divides mitotically to give rise to the two male gametes before pollen grains are shed
4.	pollens do not make gametes at all

27 In angiosperms, which cell divides mitotically to produce male gametes?

1.	Pollen mother cell	2.	Generative cell
3.	Vegetative cell	4.	Central cell

28 In over 60 % of angiosperms, pollen grains are shed at:

1.	2-celled stage	2.	3-celled stage
3.	4-celled stage	4.	1-celled stage

29 Identify the incorrect statement regarding *Parthenium* hysterophorus:

1.	Its pollens are a very common cause of severe respiratory allergies.
2.	It was introduced in India accidentally as a contaminant in wheat.
3.	It is a native of tropical America
4.	It is non-invasive and limited to certain pockets in India only

30 Pollens that cause pollinosis [nasal allergy due to pollen] are expected to belong to flowers that are pollinated by:

1.	Water	2.	Wind
3.	Insects	4.	Bats

31 Pollen grains:

I:	of carrot grass causes severe allergies and bronchial afflictions in some people often leading to chronic respiratory disorders– asthma, bronchitis, etc.
II:	are rich in nutrients.
III:	maintain viability for many months in cereals such as rice and wheat.
IV:	unlike seeds cannot be preserved in liquid nitrogen (-196°C).

1. Only **I** and **II** are correct
2. Only **III** and **IV** are correct
3. Only **I** and **III** are correct
4. Only **II** and **IV** are correct

32 At what temperature pollens can be stored for years in liquid nitrogen?

1.	0°C	2.	-100°C
3.	-196°C	4.	4°C

33 Pollen grains lose viability within 30 minutes of their release in some members of:

1.	Rosaceae	2.	Leguminosae
3.	Poaceae	4.	Solanaceae

34 Consider the given two statements:

Statement I:	In some cereals such as rice and wheat, pollen grains lose viability within 30 minutes of their release.
Statement II:	In some members of Rosaceae, Leguminosae and Solanaceae, pollen grains maintain viability for months.

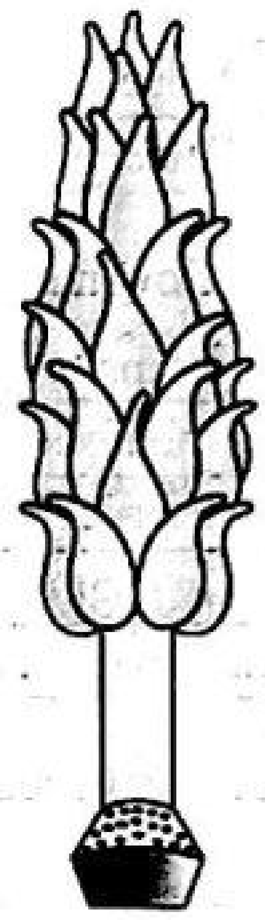
1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

35 The gynoecium with many pistils that are fused together will best be described as:
1. monocarpellary, apocarpous
2. multicarpellary, syncarpous
3. multicarpellary, synandrous
4. monocarpellary, apocarpous

36 In a multicarpellary syncarpous ovary:

1.	There is more than one pistil that is fused with the other
2.	There is more than one pistil that is free from each other
3.	There is one pistil that is fused with the stamen
4.	There is more than one pistil that is fused with the stamen

37 The following diagram shows:



1.	Multicarpellary, syncarpus pistil of Papaver
2.	Multicarpellary, apocarpus pistil of Papaver
3.	Multicarpellary, apocarpous gynoecium of Michelia
4.	Multicarpellary, syncarpous gynoecium of Michelia

38 Match the structure in Column I with the description in Column II and choose your answer from the codes given below:

	Column I		Column II
A.	Stigma	a.	Landing platform for pollen grains
B.	Ovary	b.	Basal bulged part of the pistil
C.	Placenta	c.	Part of the ovary where funiculus attaches
D.	Ovule	d.	Megasporangium

Codes

	A	B	C	D
1.	a	b	c	d
2.	a	c	b	d
3.	b	a	d	c
4.	d	c	b	a

39 From among the sets of terms given below, identify those that are associated with the gynoecium.

1.	Stigma, ovule, embryo sac, placenta
2.	Thalamus, pistil, style, ovule
3.	Ovule, ovary, embryo sac, tapetum
4.	Ovule, stamen, ovary, embryo sac

40 Identify the correct statements:

I:	The ovarian cavity inside the basal bulged part of the pistil is called as locule.
II:	The placenta is located inside the ovarian cavity.
III:	Arising from the placenta are the megasporangia, commonly called ovules.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

41 Three options given below describe the same structure in an angiosperm. Identify the one that does not belong to the group?

1. Megagametophyte
2. Megasporangium
3. Female gametophyte
4. Embryo sac

42 Xenogamy:

I:	is the transfer of pollen grains from anther to the stigma of a different plant.
II:	is the only type of pollination which during pollination brings genetically different types of pollen grains to the stigma.
III:	is cross pollination.

1.	Only **I** is correct	2.	Only **II** and **III** are correct
3.	**I, II** and **III** are correct	4.	**I, II** and **III** are incorrect

43 A typical anther in angiosperms is:

1. unilobed and dithecous
2. bilobed and dithecous
3. trilobed and dithecous
4. tetralobed and tetrathecous.

44 An anatropous ovule attaches to the placenta by means of:

1.	Funicle	2.	Raphe
3.	Hilum	4.	Integuments

45 The body of the ovule fuses with the funicle in the region called:

1.	Chalaza
2.	Micropyle
3.	Hilum
4.	Nucellus

46 Integuments of an ovule encircle the nucellus except at the tip where a small opening is organised, called the:

1.	germ pore	2.	chalaza
3.	micropyle	4.	filiform apparatus

47 In an ovule:

1.	the body fuses with hilum in the region called funicle.
2.	the chalaza is the apical part.
3.	there are two integuments in angiosperms.
4.	placenta is a stalk to which the ovary is attached.

48 Starting from the innermost part, the correct sequence of parts in an ovule are:

1.	egg, nucellus, embryo sac, integument
2.	egg, embryo sac, nucellus, integument
3.	embryo sac, nucellus, integument, egg
4.	egg, integument, embryo sac, nucellus

49 In angiosperms, the mature female gametophyte is represented by:

1.	Nucellus	2.	Megaspore
3.	MMC	4.	Embryosac

50 For megasporogenesis ovules generally differentiate a single megaspore mother cell, (MMC) in:

1.	the chalazal region of the nucellus.
2.	the micropylar region of the nucellus.
3.	the micropylar region of the embryo sac.
4.	the chalazal region of the embryo sac.

51 Consider the two statements:

Statement I:	The process of formation of megaspores from the megaspore mother cell is called megasporogenesis.
Statement II:	The process of formation of pollen grains from the pollen mother cell is called microsporogenesis.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

52 How many megaspores are formed as a result of completion of meiosis in a megaspore mother cell?

1.	0	2.	1
3.	2	4.	4

53 When the embryosac develops from a single functional megaspore [the other three get generate], it is called as:

1.	Monosporic	2.	Bisporic
3.	Trisporic	4.	Tetrasporic

54 Match the following cells with their appropriate ploidy level:

	Column A		Column B
1.	Pollen mother cell	A.	Haploid (n)
2.	Endosperm	B.	Diploid (2n)
3.	Egg cell	C.	Triploid (3n)
4.	Synergids		

Options:
1. 1-A, 2-B, 3-C, 4-A
2. 1-B, 2-C, 3-A, 4-A
3. 1-B, 2-A, 3-C, 4-B
4. 1-A, 2-C, 3-A, 4-A

55 During the monosporic development of the embryo sac in angiosperms:

I:	Three successive free nuclear mitotic divisions in the functional megaspore form the 8-nucleate stages of the embryo sac.
II:	Six of the eight nuclei are surrounded by cell walls and organized into cells.

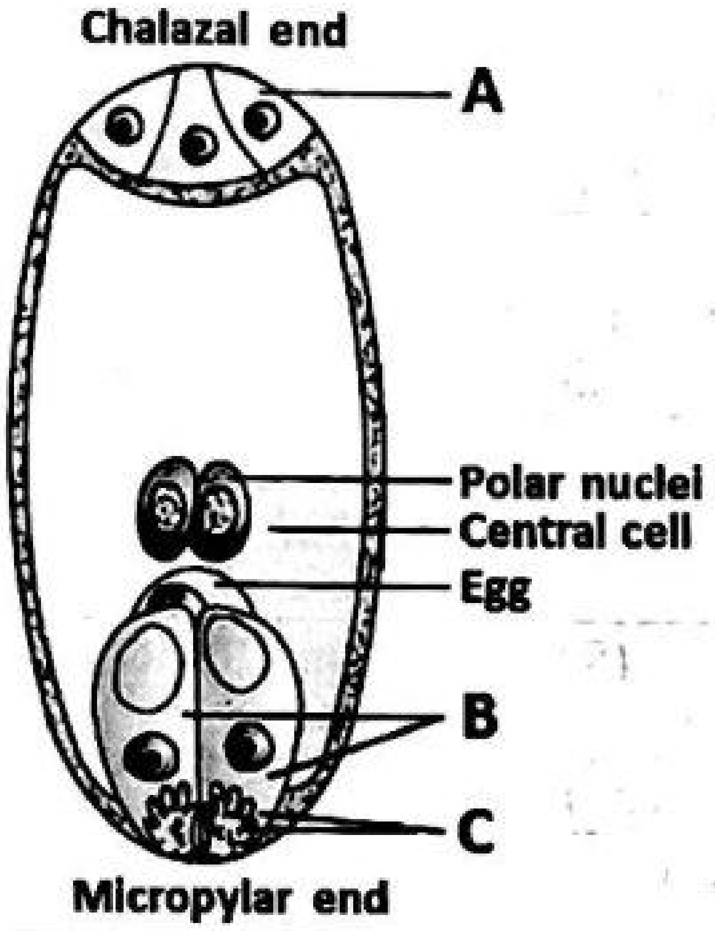
1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

56 In a typical female gametophyte [embryo sac] of angiosperms:

I:	Three cells are at the chalazal end and are called the antipodals.
II:	The large central cell has two polar nuclei.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

57 Identify A, B and C in the given diagram:



	A	B	C
1.	Antipodals	Synergids	Filiform apparatus
2.	Synergids	Antipodals	Caruncle
3.	Synergids	Antipodals	Perisperm
4.	Antipodals	Synergids	Perisperm

58 Identify the incorrect statements regarding a typical embryo sac of a flowering plant:

I:	It is 8-nucleate and 7-celled at maturity
II:	It is free-nuclear during the development
III:	It is situated inside the integument but outside the nucellus
IV:	It has an egg apparatus situated at the chalazal end

1. **I** and **IV**
2. **II** and **III**
3. **I** and **II**
4. **III** and **IV**

59 There is a characteristic distribution of the cells within the embryo sac.

a:	Three cells are grouped together at the chalazal end and constitute the egg apparatus.
b:	The egg apparatus, in turn, consists of one synergid and two egg cells.
c:	The synergids have special cellular thickenings at the chalazal tip called filiform apparatus.

1. Only **b** is correct
2. Only **c** is correct
3. Only **a** and **c** are correct
4. **a, b** and **c** are incorrect

60 What guides the entry of the pollen tube though the micropyle into the embryo sac in the angiosperms?

1.	Antipodals	2.	Filiform apparatus in synergids
3.	The egg cell	4.	Polar nuclei

61 A typical angiosperm embryosac, at maturity, is:

1.	8 celled and 8 nucleate	2.	8 celled and 7 nucleate
3.	7 celled and 8 nucleate	4.	7 celled and 7 nucleate

62 Consider the given two statements:

Statement I:	Pollination plays a critical role in the sexual reproduction in flowering plants.
Statement II:	As both types of gametes are non-motile, they have to be brought together for fertilisation to occur.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

63 Transfer of pollens from the anther to the stigma of the same flower is called:

1.	Autogamy	2.	Geitonogamy
3.	Xenogamy	4.	Cleistogamy

64 Choose the correct statement from the following:

1.	Cleistogamous flowers always exhibit autogamy
2.	Chasmogamous flowers always exhibit geitonogamy
3.	Cleistogamous flowers exhibit both autogamy and geitonogamy
4.	Chasmogamous flowers never exhibit autogamy

65 Chasmocleistogamy [Amphicarpy] is not seen in:

1.	*Viola* [Common pansy]	2.	*Oxalis*
3.	Pisum sativum	4.	*Commelina*

66 Some plants such as Viola (common pansy), Oxalis, and Commelina produce two types of flowers:

Statement I:	Cleistogamous flowers which are similar to flowers of other species with exposed anthers and stigma
Statement II:	Chasmogamous flowers which do not open at all.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

67 Consider the given two statements:

Assertion (A):	Cleistogamous flowers produce an assured seed set.
Reason (R):	Cleistogamous flowers have a well-exposed anther and stigma.

1. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
2. **(A)** is True but **(R)** is False.
3. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4. **(A)** is False but **(R)** is True.

68 In autogamy:

I:	pollination is achieved within the same flower.
II:	there is the advantage of producing high genetic diversity in the species.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

69 Geitonogamy is:

1. Functionally cross–pollination but genetically autogamy
2. Functionally autogamy but genetically cross-pollination
3. Functionally and genetically autogamy
4. Functionally and genetically cross-pollination

70 Consider the given two statements:

Assertion(A):	Although geitonogamy is functionally self-pollination, genetically it is similar to cross-pollination.
Reason (R):	Geitonogamy involves a pollinating agent since the pollen grains come from a different plant.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False
4. Both **(A)** and **(R)** are False

71 The only type of pollination which during pollination brings a genetically different type of pollen grains to the stigma is:

1. Chasmogamy
2. Cleistogamy
3. Geitonogamy
4. Xenogamy

72 Majority of plants:

1. Use abiotic agents for pollination
2. Use biotic agents for pollination
3. Do not use any agent for pollination
4. Use both abiotic and biotic agents for pollination.

73 Identify the incorrect statement:

1. Pollination by wind is more common amongst abiotic pollinations.
2. Wind-pollination is quite common in grasses.
3. Almost all gymnosperms are pollinated by wind.
4. Almost all angiosperms are pollinated by wind.

74 Consider the given two statements:

Assertion (A):	The flowers, pollinated by wind or water, produce an enormous amount of pollen when compared to the number of ovules available for pollination.
Reason (R):	Pollen grains coming in contact with the stigma is a chance factor in both wind and water pollination.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	**(A)** is False but **(R)** is True.

75 Wind-pollinated flowers are characterized by the following, except:

1.	Light and non-sticky pollen grains
2.	Well-exposed stamens
3.	Many ovules in each ovary
4.	Large, often-feathery stigma

76 Consider the given two statements:

Assertion (A):	Wind pollination requires that the pollen grains are light and non-sticky and stamens are well exposed.
Reason (R):	Light, non-sticky pollens can be transported in wind currents and pollens from well-exposed stamens are easily dispersed into wind currents.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

77 Flowers that have a single ovule in the ovary and are packed into inflorescence are usually pollinated by:

1.	Water	2.	Bee
3.	Wind	4.	Bat

78 Consider the given two statements:

Statement I:	Pollination by water is quite rare in flowering plants, limited to about 30 genera, mostly monocotyledons.
Statement II:	Water is a regular mode of transport for the male gametes among the lower plant groups such as algae, bryophytes and pteridophytes.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

79 Consider the given two statements:

Assertion (A):	For some bryophytes and pteridophytes, their distribution on land is limited.
Reason (R):	Such bryophytes and pteridophytes need water for the transport of male gametes and fertilisation.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

80 How many of the given statements are correct?

I: Vallisneria and Hydrilla grow in fresh water
II: Zostera is a marine sea-grass
III: All aquatic plants use water for pollination.
IV: Water lily is pollinated by insect.

1.	1	2.	2
3.	3	4.	4

81 Consider the given two statements:

Assertion (A):	Pollen grains are well preserved as fossils.
Reason (R):	Pollen intine is made up of sporopollenin.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

82 Consider the given two statements:

Statement I:	In water pollinated plants such as seagrasses, female flowers remain submerged in water.
Statement II:	Pollen grains in such plants are released on to the surface of water.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

83 Pollens grains are long ribbon-like and are carried passively in water in:

1.	female plants remain submerged in water
2.	male plants remain submerged in water
3.	both male and female plants remain submerged in water
4.	both male and female plants reach the surface of the water.

84 In most of the water-pollinated species, pollen grains:

1. are protected from wetting by a mucilaginous covering.
2. are light and non-sticky.
3. are produced in very few numbers.
4. are winged.

85 Consider the given two statements:

Assertion (A):	Both wind and water pollinated flowers are not very colourful and do not produce nectar.
Reason (R):	Abiotic agents are less frequently used for pollination by flowering plants than the biotic agents.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

86 The majority of water plants like water hyacinth and water lily are pollinated by:

1.	Water	2.	Wind
3.	Insects	4.	Both 2 and 3

87 Regarding the use of animals as pollinating agents by flowering plants, how many of the given statements are true?

I:	Majority of flowering plants use a range of animals as pollinating agents.
II:	Birds except sunbirds and humming birds are common pollinators.
III:	Bats also pollinate some plants.
IV:	Among the animals, insects, particularly bees are the dominant biotic pollinating agents.
V:	No known reptile is a pollinating agent for any plant.

1.	2	2.	3
3.	4	4.	5

88 How many of the given statements are correct?

I:	Majority of insect-pollinated flowers are large, colourful, fragrant and rich in nectar.
II:	When insect pollinated flowers are small, a number of flowers are clustered into an inflorescence.
III:	Animals are attracted to flowers by colour and/or fragrance.
IV:	The relationship between plants and their animal pollinators is one of the best examples of mutualism.

1.	1	2.	2
3.	3	4.	4

89 To sustain animal visits, the flowers have to provide rewards to the animals.

A:	Nectar and pollen grains are the usual floral rewards.
B:	In some species floral rewards are in providing safe places to lay eggs.

1.	Only **A** is correct	2.	Only **B** is correct
3.	Both **A** and **B** are correct	4.	Both **A** and **B** are incorrect

90 The dominating pollinating agent of flowering plants amongst animals are:

1.	Arboreal mammals	2.	Insects
3.	Birds	4.	Reptiles

91 Consider the given two statements:

Assertion (A):	Pollen grains are generally sticky in animal pollinated flowers.
Reason (R):	In general, pollination by animals occurs after they reach inside the flowers for nectar.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

92 What floral reward does *Amorphophallus* provide to its pollinator?

1. Nectar
2. Safe places to lay eggs
3. Protection from predation due to its tall height
4. Camouflage

93 The *Yucca* plant is pollinated by:

1. an obligatory mutualist moth
2. an obligatory mutualist honeybee
3. a commensal moth
4. a commensal honeybee

94 Consider the given two statements:

Statement I:	Relationship between a species of moth and the plant Yucca is obligatory.
Statement II:	The moth deposits its eggs in the locule of the ovary and the flower, in turn, gets pollinated by the moth.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

95 Consider the given two statements:

Assertion (A):	Outbreeding devices prevent self-pollination in plants.
Reason (R):	Self-pollination leads to an increase in genetic variation over time.

Choose the correct option.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

96 Consider the given two statements:

Assertion(A):	Flowering plants have developed many devices to discourage self-pollination and to encourage cross-pollination.
Reason (R):	Continued self-pollination results in inbreeding depression and a decrease in genetic variation.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

97 Study the given two statements:

A:	In some angiosperm species, pollen release and stigma receptivity are not synchronised.
B:	In some other angiosperm species, the anther and stigma are placed at different positions.

Both these devices:

I:	prevent autogamy.
II:	necessitates the use of wind or water as pollinating agents.

1.	Only **I** is true	2.	Only **II** is true
3.	Both **I** and **II** are true	4.	Both **I** and **II** are false

98 Self-incompatibility:

I:	prevents inbreeding
II:	is a genetic mechanism
III:	prevents self-pollen from fertilising the ovules by inhibiting pollen germination or pollen tube growth in the pistil.

1.	Only **I** and **II** are correct	2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct	4.	**I**, **II** and **III** are correct

99 Consider the given two statements:

Assertion (A):	Monoecy prevents autogamy but not geitonogamy.
Reason (R):	Dioecy prevents both autogamy and geitonogamy

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

100 Dioecy in flowering plants prevents:

1.	Autogamy but not Geitonogamy
2.	Geitonogamy but not Autogamy
3.	Both Geitonogamy and Autogamy
4.	Neither Geitonogamy nor Autogamy

101 If both male and female flowers are present on the same plant such as castor and maize:

I:	the plants are called as monoecious
II:	it prevents autogamy but not geitonogamy

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

102 In papaya:

I:	both male and female flowers are present on the same plant
II:	autogamy is prevented, but not geitonogamy

1.	Only **I** is true	2.	Only **II** is true
3.	Both **I** and **II** are true	4.	Both **I** and **II** are false

103 Regarding pollen-pistil Interaction:

1.	Pollination guarantees fertilisation
2.	Pollination guarantees the transfer of the right type of compatible pollen of the same species as the stigma
3.	The pistil has the ability to recognise the pollen, whether it is of the right type (compatible) or of the wrong type (incompatible).
4.	The ability of the pistil to recognise the pollen followed by its acceptance or rejection is the result of a continuous dialogue between pollen grain and the pistil mediated by neural signals.

104 Consider the given two statements:

Statement I:	The pollen can recognize the pistil, whether it is of the right type (compatible) or of the wrong type (incompatible).
Statement II:	Pollen of the same species will not be compatible and will not be allowed to germinate on the stigma.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

105 Following compatible pollination:

I:	the pollen germinates on the stigma to produce a pollen tube through one of the germ pores present in the pollen intine.
II:	the contents of the pollen grain move into the pollen tube.
III:	pollen tube grows through the tissues of the stigma and style and reaches the ovary.
IV:	if pollen grains are shed at two-celled condition the generative cell divides and forms the two male gametes during the growth of pollen tube in the stigma.

1. Only **I**, **II** and **III** are correct
2. Only **I**, **III** and **IV** are correct
3. Only **II**, **III** and **IV** are correct
4. **I**, **II**, **III** and **IV** are correct

106 In plants which shed pollen in the three-celled condition, pollen tubes carry:

1.	a single male gametes from the beginning
2.	two male gametes from the beginning
3.	two male gametes after the division in generative cell
4.	two male gametes after the division in vegetative cell

107 Pollen tube enters the ovule:

1.	through the micropyle and then enters one of the synergids through the filiform apparatus.
2.	through the chalaza and then enters one of the synergids through the filiform apparatus.
3.	through the micropyle and then enters one of the antipodals through the egg apparatus.
4.	through the chalaza and then enters one of the antipodals through the egg apparatus.

108 Consider the given two statements:

Assertion (A):	Emasculation and bagging techniques are vital for the success of artificial hybridization experiments performed by plant breeders.
Reason (R):	In such crossing experiments, it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination (from unwanted pollen).

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

109 Emasculation is done in artificial plant hybridisation experiments to:

1.	prevent undesired pollen from landing on the stigma
2.	enhance the fertility of the plant
3.	render the plant sterile
4.	prevent self-pollination in plants

110 In artificial hybridization experiments, if the female plant produces unisexual flowers, emasculation:

1.	Must be done before maturity.
2.	Must be done after maturity.
3.	Must be done at maturity.
4.	Is not needed.

111 During artificial hybridisation experiments:

I:	If the female parent produces unisexual flowers, there is no need for emasculation.
II:	The female flower buds are never bagged as well.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

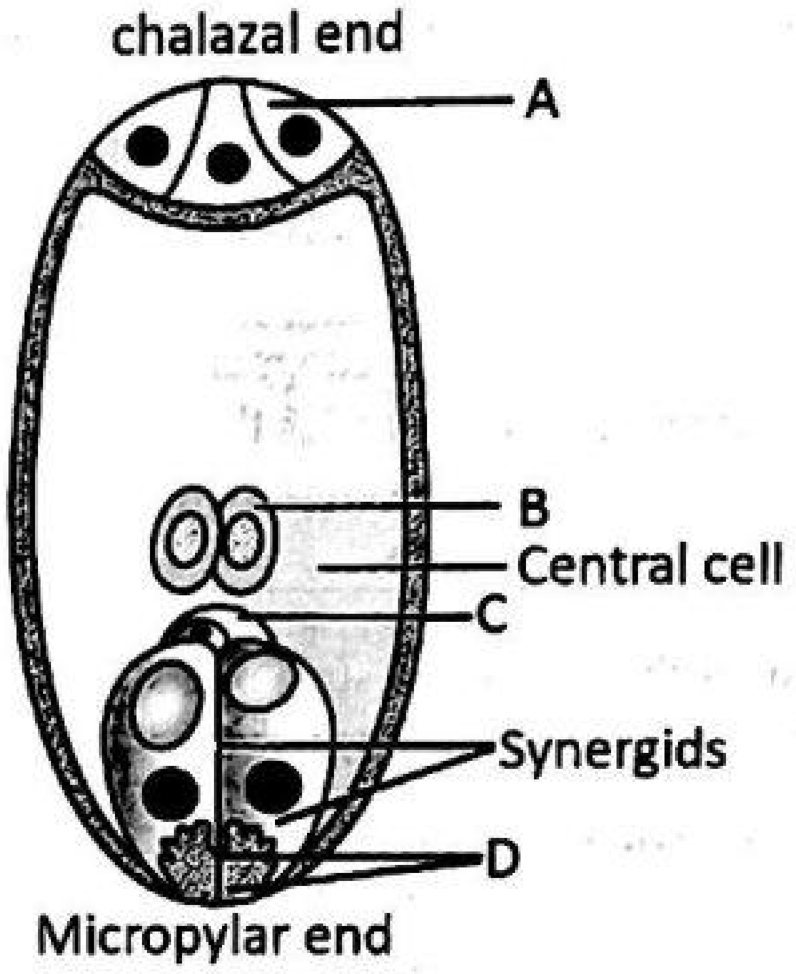
DOUBLE FERTILISATION

112 During double fertilisation in angiosperms:

I:	Syngamy results in the formation of a diploid cell, the zygote.
II:	Triple fusion results in a triploid primary endosperm nucleus (PEN).

1.	Only **I** is true
2.	Only **II** is true
3.	Both **I** and **II** are true
4.	Both **I** and **II** are false

113 Identify the correct statements regarding the given figure:



I:	'A' get degenerated and do not persist long after fertilization.
II:	'B' are involved in syngamy.
III:	'C' is involved in triple fusion.
IV:	'D' guide pollen tube entry into the embryo sac.

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **I** and **IV**
4. Only **II** and **III**

114 Double fertilization, a characteristic of angiosperms, results in the formation of:

1.	diploid zygote due to syngamy and triploid primary endosperm cell due to triple fusion
2.	triploid zygote due to triple fusion and diploid primary endosperm cell due to syngamy
3.	diploid zygote due to syngamy and haploid primary endosperm cell as it is formed pre-fertilization
4.	diploid zygote due to syngamy and diploid primary endosperm cell due to triple fusion

115 The central cell of the embryo sac:

1.	after syngamy becomes the primary endosperm cells
2.	after syngamy becomes the zygote
3.	after triple fusion becomes the primary endosperm cell
4.	after triple fusion becomes the zygote

116 How many of the given statements regarding double fertilization in angiosperms is/are true?

I:	After entering one of the synergids, the pollen tube releases the two male gametes into the cytoplasm of the synergid.
II:	One of the male gametes moves towards the egg cell and fuses with its nucleus, thus completing the syngamy.
III:	The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus (PEN).
IV:	The central cell, after triple fusion, becomes the primary endosperm cell (PEC) and develops into the endosperm, while the zygote develops into an embryo

1. 1
2. 2
3. 3
4. 4

117 Consider the given two statements:

Assertion (A):	Angiosperms exhibit double fertilization.
Reason (R):	Two fusion events occur in each embryo sac, namely syngamy and triple fusion.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

POST-FERTILISATION: STRUCTURES AND EVENTS

118 During the development of the embryo in angiosperms, which stage follows the zygote formation?

1. Globular stage
2. Heart stage
3. Cotyledon stage
4. Mature embryo

119 Endosperm development precedes embryo development. Why?

1.	Endosperm is triploid tissue in angiosperms.
2.	Endosperm can be free nuclear or cellular type.
3.	Endosperm contains growth factors necessary to induce dormancy if conditions are unfavourable.
4.	Endosperm cells are filled with reserve food materials and are used for the nutrition of the developing embryo.

120 How many of the given statements regarding endosperm tissue in angiosperms are correct?

I:	In the most common type of endosperm development, the primary endosperm nucleus (PEN) undergoes successive nuclear divisions to give rise to free nuclei, and subsequently cell wall formation occurs and the endosperm becomes cellular.
II:	The number of free nuclei formed before cellularization is uniform in all angiosperms.
III:	The coconut water from tender coconut that you are familiar with, is nothing but free-nuclear endosperm (made up of thousands of nuclei) and the surrounding white kernel is the cellular endosperm.

1. 0
2. 1
3. 2
4. 3

121 Endosperm is completely consumed by the developing embryo in all of the following angiosperms, except:

1.	pea	2.	groundnut
3.	beans	4.	coconut

122 The endosperm is usually completely consumed by the developing embryo in all the following except:

1.	Pea	2.	Castor
3.	Bean	4.	Groundnut

123 Consider the given two statements:

Assertion (A):	Most zygotes divide only after certain amount of endosperm is formed.
Reason (R):	Embryo develops at the micropylar end of the embryo sac where the zygote is situated.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	**(A)** is False but **(R)** is True.

124 A typical dicotyledonous embryo consists of an embryonal axis and two cotyledons, where:

I:	The portion of embryonal axis above the level of cotyledons is the epicotyl, which terminates with the plumule or stem tip.
II:	The cylindrical portion below the level of cotyledons is hypocotyl that terminates at its lower end in the radicle or root tip.

1.	Only **I** is true
2.	Only **II** is true
3.	Both **I** and **II** are true
4.	Both **I** and **II** are false

125 Scutellum is:

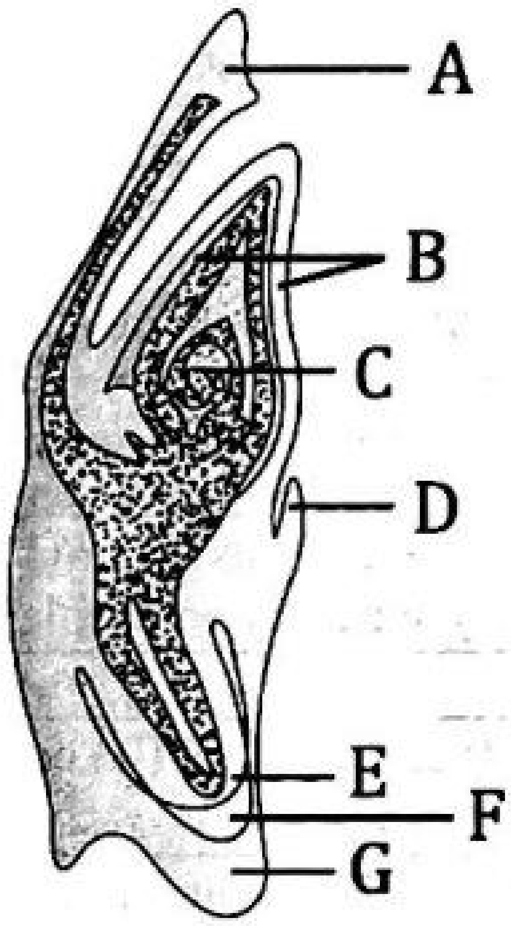
1.	the cotyledon in seeds of the grass family
2.	globular embryo of a dicot
3.	persistent nucellus in a seed
4.	undifferentiated sheath enclosing root cap in monocot seeds

126 A typical dicotyledonous embryo, consists of an embryonal axis and two cotyledons and where:

Statement I:	The portion of embryonal axis above the level of cotyledons is the coleoptiles.
Statement II:	The cylindrical portion below the level of cotyledons is the coleorhiza.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

127 Which alphabets represent scutellum, epiblast, and coleorhiza in the given figure?



	Scutellum	Epiblast	Coleorhiza
1.	A	D	G
2.	B	C	E
3.	A	D	F
4.	B	D	G

128 In angiosperms:

I:	the seed is the final product of sexual reproduction.
II:	the seed is often described as a fertilised ovule.
III:	seeds are formed inside fruits.

1.	Only **I** and **II** are correct	2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct	4.	**I, II** and **III** are correct

129 What distinguishes albuminous seeds from ex-albuminous seeds?

1.	Albuminous seeds have residual endosperm, while ex-albuminous seeds do not.
2.	Albuminous seeds lack a seed coat, while ex-albuminous seeds have one.
3.	Ex-albuminous seeds are produced by monocots, albuminous by dicots.
4.	Ex-albuminous seeds develop underground, whereas albuminous seeds develop above ground.

130 Match each item in Column I with one in Column II and select the best match from the codes given:

	Column I		Column II
A.	Non- albuminous seeds	P.	pea, groundnut
B.	Albuminous seeds	Q.	wheat, maize
C.	Perisperm present	R.	black pepper, beet

Codes:

	A	B	C
1.	P	Q	R
2.	P	R	Q
3.	R	P	Q
4.	R	Q	P

131 Occasionally, in some seeds such as black pepper and beet, remnants of nucellus are also persistent. This residual, persistent nucellus is the:

1.	endosperm	2.	perisperm
3.	pericarp	4.	periderm

132 Which of the following statements is incorrect?

1.	Integuments of ovules harden as tough protective seed coats in angiosperms.
2.	The micropyle remains as a small pore in the seed coat.
3.	As the seed matures, its water content is increased and may contain 90-95 per cent moisture by mass).
4.	If favourable conditions are available (adequate moisture, oxygen and suitable temperature), seeds usually germinate.

133 Consider the given statements:

I:	As ovules mature into seeds, the ovary develops into a fruit.
II:	The transformation of ovules into seeds and ovary into fruit proceeds simultaneously.
III:	The wall of the ovary develops into the wall of fruit called endocarp.

1.	Only I and II are correct	2.	Only I and III are correct
3.	Only II and III are correct	4.	I, II and III are correct

134 Identify the incorrectly matched pair:

1.	Triploid nutritive tissue of a seed deposited externally to the embryo sac	Perisperm
2.	The tissue that arises from the ripened ovary wall of a fruit; the fruit wall	Pericarp
3.	The natural or artificially induced production of fruit without fertilisation of ovules	Parthenocarpy
4.	Asexual reproduction where the growth and development of embryos occur without fertilization by sperm	Parthenogenesis

135 Identify the correct statements from the ones given below:

I:	In a few species, such as apple, strawberry, cashew, etc., the thalamus also contributes to fruit formation.
II:	Most fruits develop only from the ovary and are called true fruits.
III:	Fruits can never develop without fertilisation.

1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

136 Parthenocarpy:

I:	is production of seeds without fertilisation
II:	means that fruits develop without fertilisation
III:	can be induced through the application of growth hormones
IV:	leads to production of seedless fruits

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

137 In bananas, fruits can develop without fertilization. Such fruits are called as:

1.	Parthenogenetic	2.	Parthenocarpic
3.	True	4.	False

138 All the following are advantages seeds offer to angiosperms:

I:	Seed formation is more dependable.
II:	Seeds have better adaptive strategies for dispersal to new habitats.
III:	Seeds preserve genetic homogeneity and do not allow new variations in the gene pool.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

139 Seed formation is a more dependable reproductive strategy in angiosperms because:

1.	Pollination and fertilization are independent of water
2.	Seeds have better adaptive strategies for dispersal
3.	Seeds have sufficient food reserves
4.	New genetic combinations are generated during seed formation

140 Consider the given two statements:

Assertion (A):	In angiosperms, seed formation is more dependable for propagating themselves
Reason (R):	Seed formation is generally the result of sexual reproduction in angiosperms.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

141 Consider the given two statements:

Assertion (A):	Seed is the basis of our agriculture.
Reason (R):	Seeds are the products of sexual reproduction in angiosperms.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

142 A recent record of 2000 years old viable seed has been discovered during the archaeological excavation at King Herod's palace near the Dead Sea. This seed is of:

1.	*Lupinus arcticus*	2.	*Phoenix dactylifera*
3.	*Strobilanthes kunthiana*	4.	*Arabidopsis thaliana*

APOMIXIS AND POLYEMBRYONY

143 Apomixis is:

I:	production of seeds without fertilization
II:	production of fruits without fertilization
III:	a form of asexual reproduction that mimics sexual reproduction

1. Only **I** and **II** are correct
2. Only **I** is correct
3. Only **III** is correct
4. Only **I** and **III** are correct

144 Identify the incorrect statement:

1. Apomixis is fruit production without fertilization.
2. Apomixis is a form of asexual reproduction that mimics sexual reproduction.
3. Polyembryony is seen in many Citrus and Mango varieties.
4. Apomixis in hybrid varieties makes the hybrid useless.

145 What does polyembryony refer to?

1. Formation of a single embryo from two different pollen grains, e.g., apple
2. Development of multiple embryos from a single fertilized egg, e.g., citrus
3. Formation of an embryo without fertilization, e.g., wheat
4. Fusion of two embryos to form a single viable seed, e.g., maize

146 Polyembryony in mango is due to:

1. The formation of multiple zygotes
2. The development of additional embryos from the integument
3. The development of embryos from somatic cells of the ovule
4. Fertilization of multiple ovules within the same ovary

147 Nucellar polyembryony:

I:	is a type of apomixis
II:	produces embryos that are genetically identical to the parent plant

1. Both **I** and **II** are correct
2. Only **I** is correct
3. Only **II** is correct
4. Both **I** and **II** are incorrect

148 Consider the given two statements:

Assertion (A):	Hybrid varieties of several of our food and vegetable crops are being extensively cultivated.
Reason (R):	Hybrid seeds have to be produced every year.

1. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2. **(A)** is True but **(R)** is False.
3. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4. **(A)** is False but **(R)** is True.

149 Consider the given two statements:

Assertion (A):	Active research is going on in many laboratories around the world to understand the genetics of apomixis and to transfer apomictic genes into hybrid varieties.
Reason (R):	Hybrid crop varieties do not reproduce sexually.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False
4. Both **(A)** and **(R)** are False

SEXUAL REPRODUCTION IN FLOWERING PLANTS - ANSWER KEY

1.	(3)	2.	(3)	3.	(1)	4.	(3)	5.	(4)	6.	(4)	7.	(3)	8.	(1)	9.	(4)	10.	(3)
11.	(1)	12.	(3)	13.	(4)	14.	(4)	15.	(1)	16.	(1)	17.	(2)	18.	(1)	19.	(1)	20.	(4)
21.	(1)	22.	(1)	23.	(4)	24.	(2)	25.	(1)	26.	(2)	27.	(2)	28.	(1)	29.	(4)	30.	(2)
31.	(1)	32.	(3)	33.	(3)	34.	(1)	35.	(2)	36.	(1)	37.	(3)	38.	(1)	39.	(1)	40.	(4)
41.	(2)	42.	(3)	43.	(2)	44.	(1)	45.	(3)	46.	(3)	47.	(3)	48.	(2)	49.	(4)	50.	(2)
51.	(1)	52.	(4)	53.	(1)	54.	(2)	55.	(3)	56.	(3)	57.	(1)	58.	(4)	59.	(4)	60.	(2)
61.	(3)	62.	(1)	63.	(1)	64.	(1)	65.	(3)	66.	(4)	67.	(2)	68.	(1)	69.	(1)	70.	(4)
71.	(4)	72.	(2)	73.	(4)	74.	(3)	75.	(3)	76.	(1)	77.	(3)	78.	(1)	79.	(1)	80.	(3)
81.	(3)	82.	(3)	83.	(1)	84.	(1)	85.	(2)	86.	(4)	87.	(2)	88.	(4)	89.	(3)	90.	(2)
91.	(2)	92.	(2)	93.	(1)	94.	(1)	95.	(3)	96.	(1)	97.	(1)	98.	(4)	99.	(2)	100.	(3)
101.	(3)	102.	(4)	103.	(3)	104.	(3)	105.	(3)	106.	(2)	107.	(1)	108.	(1)	109.	(4)	110.	(4)
111.	(1)	112.	(3)	113.	(3)	114.	(1)	115.	(3)	116.	(4)	117.	(1)	118.	(1)	119.	(4)	120.	(3)
121.	(4)	122.	(2)	123.	(1)	124.	(3)	125.	(1)	126.	(3)	127.	(1)	128.	(4)	129.	(1)	130.	(1)
131.	(2)	132.	(3)	133.	(1)	134.	(1)	135.	(1)	136.	(3)	137.	(2)	138.	(1)	139.	(1)	140.	(2)
141.	(2)	142.	(2)	143.	(4)	144.	(4)	145.	(2)	146.	(3)	147.	(1)	148.	(1)	149.	(3)		

INTRODUCTION

1 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A.	Transfer of sperms into the female genital tract	P.	Fertilisation
B.	Embryonic development	Q.	Insemination
C.	Attachment of blastocyst to the uterine wall	R.	Gestation
D.	Fusion of male and female gametes	S.	Implantation

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	R	Q	S	p
3.	Q	R	S	P
4.	S	P	R	Q

THE MALE REPRODUCTIVE SYSTEM

2 Consider the given two statements:

Assertion (A):	Testes in males and ovaries in females are the primary sex organs.
Reason (R):	The primary sex organs are those that are located within the pelvic cavity and the secondary sex organs are the external genitalia.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

3 The testes are situated outside the abdominal cavity within a pouch called the scrotum. This is necessary as:

1.	The scrotum can contain lengthy ducts for the transfer of sperms
2.	Scrotum helps in maintaining the low temperature of the testes necessary for spermatogenesis
3.	Scrotum reduces the pressure around the testes necessary for spermatogenesis
4.	Scrotum can store huge amounts of sperms

4 Which of the following will not be a correct match for testes?

1.	Length	about 4 to 5 cm
2.	Width	about 2 to 3 cm
3.	Lobes	three in right and two in left
4.	Temperature	2–2.5°C lower than the normal internal body temperature

5 The number of testicular lobules in the testis is about:

1.	50	2.	150
3.	200	4.	250

6 Sperms are produced in:

1.	Rete testes	2.	Epididymis
3.	Seminiferous tubules	4.	Vas deferens

7 Each seminiferous tubule is lined on its inside by two types of cells:

I:	male germ cells which undergo meiotic divisions finally leading to sperm formation
II:	Sertoli cells that secrete the androgens

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

8 Leydig cells:

1.	Are present in seminiferous tubules and secrete androgens
2.	Are present in seminiferous tubules and help in the maturation of sperms
3.	Are present in interstitial space and secrete androgens
4.	Are present in interstitial space and help in the maturation of sperms

9 The correct sequence of male sex accessory ducts beginning from testis would be:

1.	rete testis → vasa efferentia → epididymis → vas deferens
2.	rete testis → vas deferens → vasa efferentia → epididymis
3.	vas deferens → vasa efferentia → epididymis → rete testis
4.	vasa efferentia → vasa deferens → epididymis → rete testis

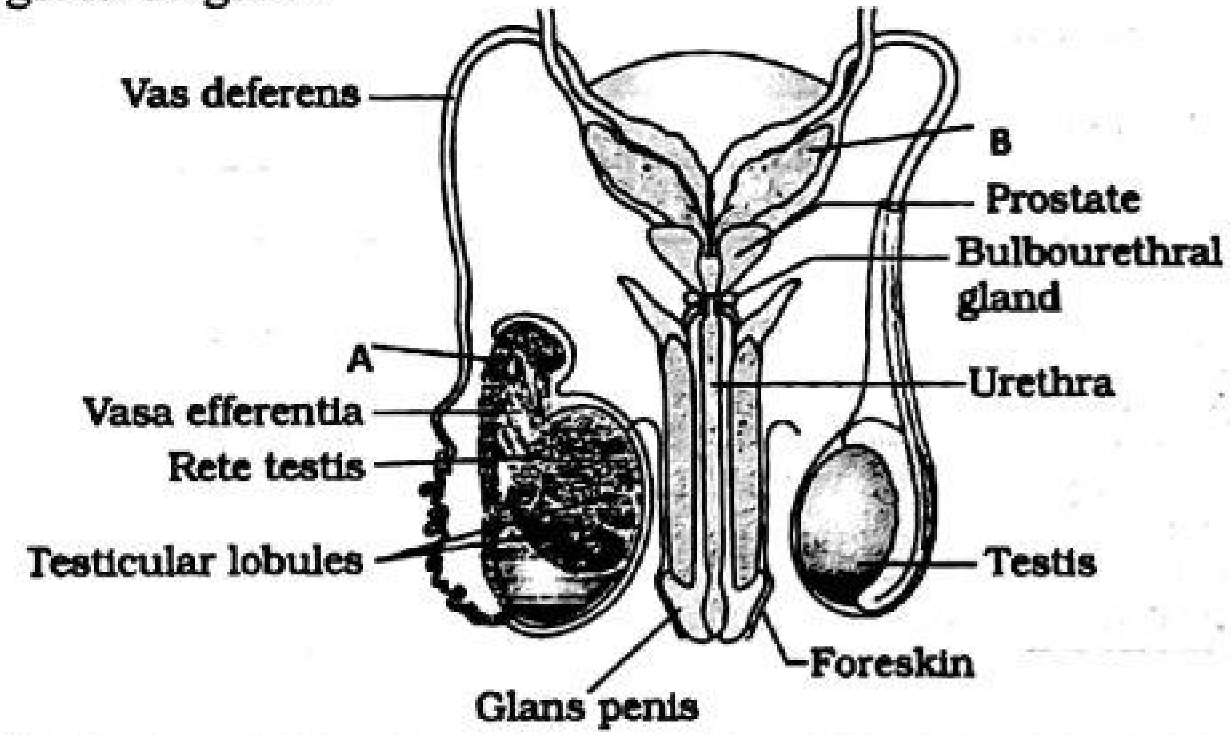
10 The ducts of the seminal vesicles open into:

1.	Ejaculatory duct	2.	Rete testis
3.	Urethra	4.	Vas deferens

11 Which of the following is not a male accessory sex gland?

1.	Bulbourethral gland	2.	Testis
3.	Prostate	4.	Seminal vesicles

12 What will be true for the parts labels A and B in the given diagram?



I:	A is the longest male sex accessory duct and stores sperms.
II:	B is the only gland that does not contribute significantly to the composition of the seminal plasma.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

13 Where are the sperm cells primarily stored in the human males?

1.	vas deferens	2.	ejaculatory ducts
3.	epididymis	4.	seminal vesicles

14 How many of the given statements regarding the male sex accessory ducts are correct?

I:	The male sex accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens.
II:	The seminiferous tubules of the testis open into the vasa efferentia through rete testis.
III:	The vasa efferentia leave the testis and open into epididymis located along the posterior surface of each testis.
IV:	The epididymis leads to vas deferens that ascends to the abdomen and loops over the urinary bladder.
V:	Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.
VI:	Ejaculatory ducts store and transport the sperms from the testis to the outside through urethra.
VII:	The urethra originates from the urinary bladder and extends through the penis to its external opening called urethral meatus.

1.	4	2.	5
3.	6	4.	7

15 Identify the part of the male reproductive system where sperms mature and gain capability of motility:

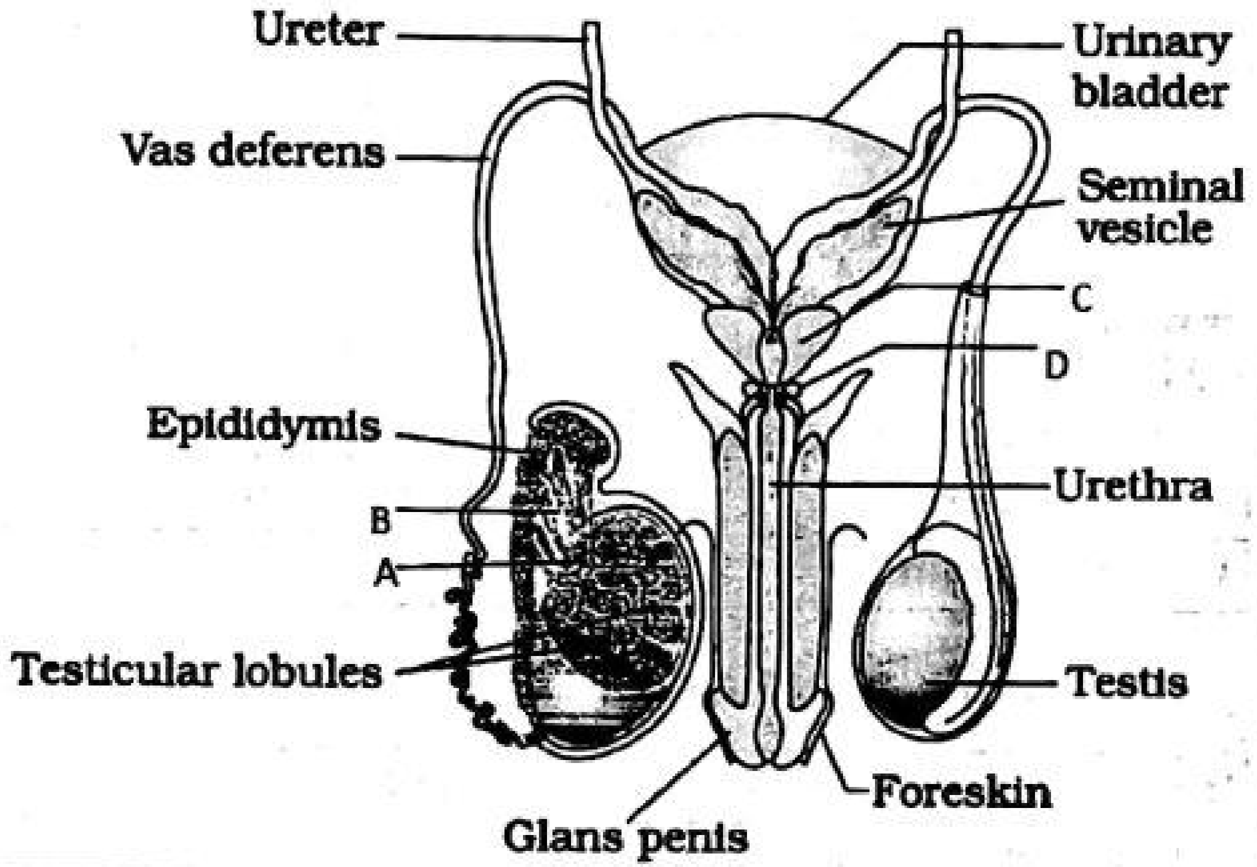
1. Epididymis
2. Vas deferens
3. Seminal vesicles
4. Prostate gland

16 Seminal plasma contains:

I:	secretions of seminal vesicles, prostate and bulbo-urethral glands.
II:	sperms

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

17 Identify A, B, C and D in the given diagram:



	A	B	C	D
1.	Seminiferous tubule	Rete testes	Prostate	Bulbourethral gland
2.	Rete testes	Vasa efferentia	Prostate	Bulbourethral gland
3.	Rete testes	Vasa efferentia	Bulbourethral gland	Prostate
4.	Seminiferous tubule	Rete testes	Bulbourethral gland	Prostate

18 Identify the paired structures:

I:	seminal vesicle
II:	vas deferens
III:	bulbourethral gland
IV:	prostate gland

1.	Only **I, II** and **III**	2.	Only **I, III** and **IV**
3.	Only **II** and **III**	4.	**I, II, III** and **IV**

19 What is the urethral meatus?

1.	The point of entry of urethra into the prostate gland
2.	Opening of ejaculatory duct into urethra
3.	External opening of the urethra
4.	Muscles surrounding the urethra

20 Seminal plasma is rich in:

1. Sucrose, calcium and certain enzymes
2. Glucose, sodium and certain enzymes
3. Fructose, calcium and certain enzymes
4. Fructose, sodium and certain enzymes

THE FEMALE REPRODUCTIVE SYSTEM

21 Ovaries are the primary sex organs in human females because they:

I:	Produce the female gamete.
II:	Produce the hormone that regulates the development of secondary sexual characters.

1.	Both **I** and **II**	2.	Only **I**
3.	Only **II**	4.	None

22 The ovaries are located:

1.	In a sac outside the body	2.	In the lower abdomen
3.	In the upper abdomen	4.	In the thorax

23 Each ovary is connected to the pelvic wall and the uterus by:

1.	Peritoneum	2.	Adipose tissue
3.	Ligaments	4.	Areolar tissue

24 All of the following will be true for ovaries, except:

1.	Ovaries are the primary female sex organs that produce the female gamete and several gonadotropins.
2.	The ovaries are located one on each side of the lower abdomen
3.	Each ovary is about 2 to 4 cm in length and is connected to the pelvic wall and uterus by ligaments.
4.	Each ovary is covered by a thin epithelium which encloses the ovarian stroma. The stroma is divided into two zones – a peripheral cortex and an inner medulla.

25 Which of the following will not be true for fallopian tubes [oviducts]?

1.	These are female accessory ducts.
2.	Each fallopian tube is about 10-12 cm long and extends from the periphery of each ovary to the uterus.
3.	The part closer to the ovary is the funnel-shaped infundibulum, which possesses finger-like projections called fimbriae.
4.	The oviducts are lined by brush bordered epithelium.

26 Consider the given two statements:

Statement I:	The part of the oviducts (fallopian tubes) closer to the ovary is the funnel-shaped infundibulum.
Statement II:	The last part of the oviduct, isthmus, has a narrow lumen and it joins the uterus.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is correct; **Statement II** is correct
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

27 The birth canal is formed by:

1. Vagina alone
2. Vagina and the cervix
3. Vagina, cervix and uterus
4. Vagina, cervix, uterus and oviducts

28 Identify the incorrectly matched pair, from following:

1.	Shape of non-pregnant uterus	Inverted pear like
2.	Perimetrium of uterus	Outermost thick, tough and inelastic ligament
3.	Myometrium of uterus	Middle thick layer of smooth muscle
4.	Endometrium of uterus	Inner glandular layer

29 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		Column II
A.	Birth canal	P.	oviducts (fallopian tubes), uterus and vagina
B.	Female accessory ducts	Q.	cervical canal and vagina
C.	Myometrium	R.	undergoes cyclical changes during menstrual cycle
D.	Endometrium	S.	exhibits strong contraction during delivery of the baby

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	P	Q	S	R
3.	Q	P	R	S
4.	Q	P	S	R

30 The layer of the uterine wall that undergoes cyclical changes during the menstrual cycle is the:

1.	Endometrium	2.	Myometrium
3.	Perimetrium	4.	Fundus

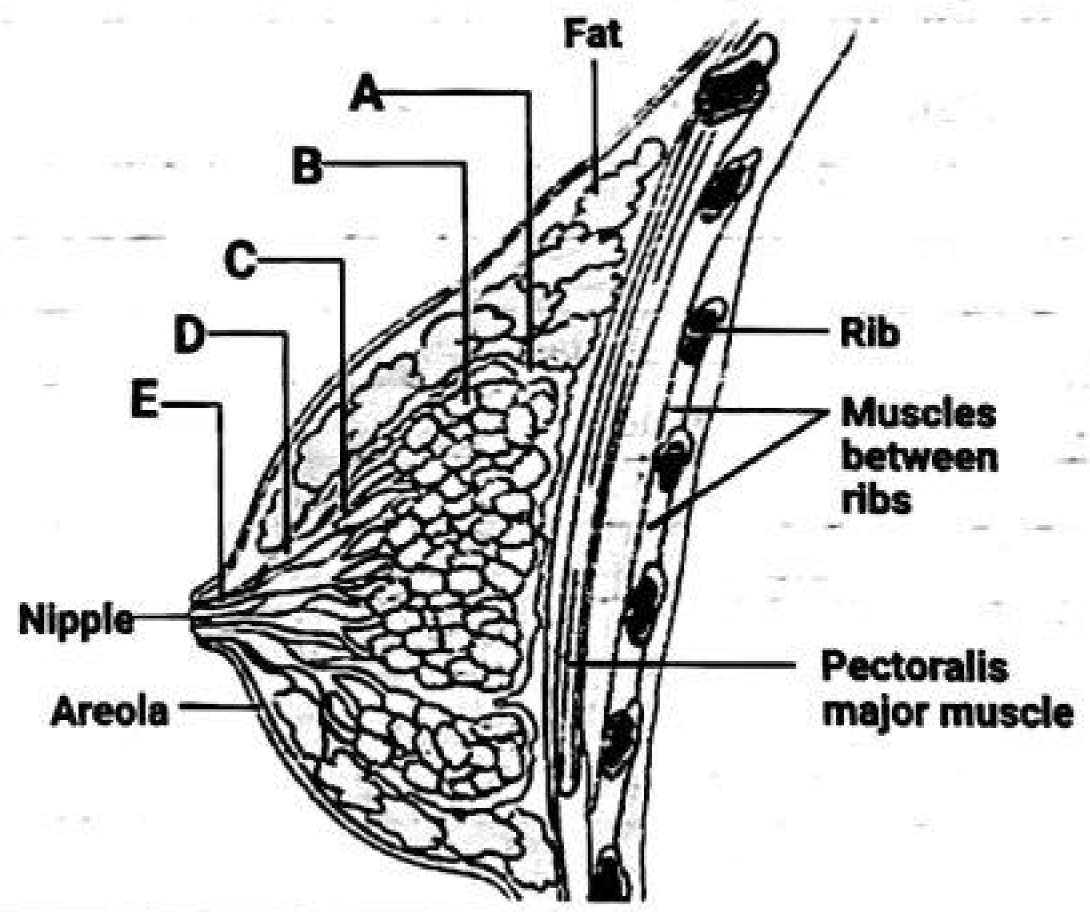
31 Consider the following two statements:

I:	The hymen is often torn during the first coitus.
II:	The presence or absence of hymen is a reliable indicator of virginity.

Of the two statements:

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct but **II** is incorrect.
4. Both **I** and **II** are incorrect.

32 In the diagram A, B, C, D, and E respectively are :



1.	Mammary lobe, Mammary alveolus, mammary duct, ampulla, Lactiferous
2.	Mammary alveolus, Mammary lobe, ampulla, mammary duct, Lactiferous
3.	Mammary duct, ampulla, Lactiferous, Mammary lobe, Mammary alveolus
4.	Ampulla, Lactiferous, Mammary lobe, Mammary alveolus, mammary duct

33 Regarding mammary gland in female mammals:

I:	The cells of alveoli secrete milk, which is stored in the cavities (lumens) of alveoli.
II:	Milk is sucked out through the mammary ducts.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

GAMETOGENESIS

34 Which of the following cells will have two sets of chromosomes?

a. Primary spermatocyte
b. Spermatogonia
c. First polar body
d. Second polar body

1. Only a and b
2. Only c and d
3. Only a and c
4. Only b and d

35 How many of the given statements are true?

A:	Spermatogonia have 46 chromosomes and always undergo meiotic cell division
B:	Primary spermatocytes divide by mitotic cell division
C:	Secondary spermatocytes have 23 chromosomes and undergo second meiotic division
D:	Spermatozoa are transformed into spermatids

1. 1
2. 2
3. 3
4. 4

36 Chose the correct chronological order in which the following cells are produced:

a.	primary spermatocytes	b.	secondary spermatocytes
c.	spermatids	d.	spermatogonia
e	sperm cells		

1.	a,b,c,d,e	2.	b,a,c,e,d
3.	c,a,b,d,e	4.	d,a,b,c,e

37 Only one set of chromosomes will be present in:

1.	Spermatogonia	2.	Zygote
3.	Secondary oocyte	4.	Oogonia

38 Consider the given two statements:

Statement I:	A primary spermatocyte completes the first meiotic division (reduction division) leading to formation of two equal, haploid cells called secondary spermatocytes, which have only 23 chromosomes each.
Statement II:	The secondary spermatocytes undergo the second meiotic division to produce four equal, haploid spermatids, which have 23 chromosomes each.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

39 The process by which mature spermatids are released from the supporting somatic Sertoli cells into the lumen of the seminiferous tubule is called:

1. Spermiogenesis
2. Spermiation
3. Emission
4. Ejaculation

40 Spermatogenesis starts at the age of puberty due to significant increase in the secretion of:

1.	LH by anterior pituitary	2.	Inhibin by Sertoli cells
3.	GnRH by hypothalamus	4.	Androgens by Leydig cells

41 Consider the following statements about spermatogenesis:

I:	It occurs in the seminiferous tubules of the testes.
II:	It results in the formation of four haploid sperm cells from each diploid primary spermatocyte.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statements** are correct.
4. Neither **Statement** is correct.

42 Consider the given two statements:

Statement I:	The spermatids are transformed into spermatozoa (sperms) by the process called spermiogenesis.
Statement II:	After spermiogenesis, sperm heads become embedded in the Sertoli cells, and are finally released into the seminiferous tubules by the process called spermiation.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

43 In males:

I:	FSH acts at the Leydig cells and stimulates synthesis and secretion of androgens.
II:	Androgens, in turn, stimulate the process of spermatogenesis.
III:	LH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis.

1. Only **II** is correct
2. Only **I** and **III** are correct
3. **I, II** and **III** are correct
4. **I, II** and **III** are incorrect

44 Which hormone acts on Sertoli cells to stimulate the secretion of some factors that help in the process of spermiogenesis?

1.	LH	2.	Progesterone
3.	FSH	4.	Estrogen

45 Regarding the structure of a sperm, all the following will be true except:

1.	A plasma membrane envelops only the head and acrosome of the sperm.
2.	The sperm head contains an elongated, haploid nucleus.
3.	The anterior portion of the head is covered by a cap-like structure, acrosome, which is filled with enzymes that help fertilization of the ovum.
4.	The middle piece possesses numerous mitochondria, which produce energy for the movement of the tail that facilitates sperm motility essential for fertilization.

46 Which part of the human sperm has a large number of mitochondria essential for sperm motility?

1. Head
2. Middle piece
3. Acrosome
4. Tail

47 The part of the human sperm which contains enzymes [sperm lysins] that help penetrate the egg is the:

1.	Head	2.	Midpiece
3.	Tail	4.	Acrosome

48 What would be a normal finding on semen analysis of a normal fertile male?

I:	A count of 10 million sperms per ml of semen
II:	60 percent sperms have normal shape and size
III:	60 percent sperms show vigorous motility

1.	Only **II**	2.	Only **I** and **II**
3.	Only **II** and **III**	4.	**I, II** and **III**

49 For normal male fertility:

I:	at least 60 per cent sperms must have normal shape and size
II:	at least 40 per cent of them must show vigorous motility

1. Only **I** is correct	2. Only **II** is correct
3. Both **I** and **II** are correct	4. Both **I** and **II** are incorrect

50 Consider the given two statements:

Statement I:	Secretions of epididymis, vas deferens, seminal vesicle and prostate are essential for maturation and motility of sperms.
Statement II:	The functions of male sex accessory ducts and glands are maintained by the gonadotropins.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

51 What is/are key difference(s) between spermatogenesis and oogenesis?

I:	Spermatogenesis produces four viable sperm, while oogenesis results in one ovum and polar bodies.
II:	Spermatogenesis occurs throughout life since birth, whereas oogenesis is completed before birth.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

52 Oogenesis is initiated:

1.	During the fetal life	2.	Just before birth
3.	Just after birth	4.	At puberty

53 In humans, the process of spermatogenesis in males and oogenesis in females are similar in:

1.	Age at which the processes begin
2.	The number of resultant haploid cells
3.	Cytokinesis
4.	Occurring in respective primary sex organs

54 During oogenesis, a polar body is formed:

I:	before fertilization.
II:	after fertilization.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

55 What is the role played by the tiny polar bodies formed during oogenesis?

1.	They act as reserve eggs for fertilization.
2.	They provide nutrition to the ovum.
3.	They act as dumping grounds for additional genetic material.
4.	They form the placenta.

56 Which of the following statements about oogenesis in humans is incorrect?

1.	Oogenesis begins before birth with the formation of primary oocytes during fetal development.
2.	A secondary oocyte is released during ovulation, and meiosis II is completed after fertilization.
3.	All primary oocytes continue meiosis I during puberty, resulting in the formation of secondary oocytes.
4.	The first meiotic division is begun prior to birth, resulting in the formation of primary oocytes that remain arrested in prophase I until puberty.

57 Consider the given two statements:

Statement I:	No more oogonia are formed and added after birth.
Statement II:	A large number of follicles degenerate during the phase from birth to puberty.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

58 What would be the advantage of the fact that the secondary oocyte retains bulk of the nutrient rich cytoplasm of the primary oocyte?

1.	This ensures dumping of extra genetic material
2.	This ensures nutrition for the early embryo
3.	This ensures easy passage of the released oocyte in the oviduct
4.	This ensures equal holoblastic cleavage after fertilisation

59 The division of primary oocyte results in:

1.	unequal cells – a smaller haploid secondary oocyte and a larger diploid polar body
2.	unequal cells – a larger haploid secondary oocyte and a smaller haploid polar body
3.	unequal cells – a smaller diploid secondary oocyte and a larger haploid polar body
4.	equal cells – a haploid secondary oocyte and a haploid polar body

60 At what stage of follicular development does the occyte completes its first meiotic division?

1.	Primordial follicle	2.	Primary follicle
3.	Secondary follicle	4.	Tertiary follicle

61 When a female is born, her ovary contains a large number of:

1.	primary follicles with primary oocytes arrested at Meiosis I
2.	primary follicles with primary oocytes arrested at Meiosis II
3.	secondary follicles with secondary oocytes arrested at Meiosis I
4.	secondary follicles with secondary oocytes arrested at Meiosis II

62 What is the usual number of primary follicles in both ovaries of a female at puberty?

1.	60000 – 80000	2.	120000 – 160000
3.	1 million to 2 million	4.	About 7 million

63 The final mature follicle is called:

1.	Primordial follicle	2.	Primary follicle
3.	Vesicular follicle	4.	Graafian follicle

64 A maturing ovarian follicle consisting of an oocyte surrounded by two or more layers of tall, supporting granulosa cells but lacking an antrum is:

1.	Primordial follicle	2.	Primary follicle
3.	Secondary follicle	4.	Graafian follicle

65 The tertiary follicle:

I:	is characterised by a fluid filled cavity called antrum.
II:	has a theca interna but not a theca externa.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

66 The number of meiocytes required to produce 400 sperms and 400 ova in humans will respectively be:

1.	100 and 100	2.	200 and 400
3.	100 and 400	4.	400 and 400

67 What is released at ovulation?

1.	Primary oocyte arrested at meiosis I
2.	Primary oocyte arrested at meiosis II
3.	Secondary oocyte arrested at meiosis I
4.	Secondary oocyte arrested at meiosis II

68 The first polar body born out of first meiotic division during oogenesis:
I: may divide further
II: may degenerate

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

MENSTRUAL CYCLE

69 The first menstruation begins at puberty and is called as:

1.	Menarche	2.	Menopause
3.	Thelarche	4.	Pubarche

70 How many of the given statements regarding menstrual cycle are correct?

I:	The reproductive cycle in the female primates is called menstrual cycle.
II:	The first menstruation begins at puberty and is called menarche.
III:	Normally, one ovum is released (ovulation) during the middle of each menstrual cycle.
IV:	The cycle starts with the menstrual phase.
V:	In human beings, menstrual cycle ceases at around 50 years of age; that is termed as menopause.

1. 2
2. 3
3. 4
4. 5

71 How many of the given statements regarding the reproductive cycle in the human females are correct?

I:	The first menstruation begins at puberty and is called menarche.
II:	In human females, menstruation is repeated at an average interval of about 28/29 days.
III:	The cycle of events starting from one menstruation till the next one is called the menstrual cycle.
IV:	Cyclic menstruation is an indicator of normal reproductive phase and extends between menarche and menopause.

1. 1
2. 2
3. 3
4. 4

72 Consider the following statements:

I:	Menstruation only occurs if the released ovum is not fertilized.
II:	Lack of menstruation always indicates pregnancy.

Of the given statements, the correct statements is/are:

1.	**I only**	2.	**II only**
3.	**I and II**	4.	None

73 Consider the given two statements:

Statement I:	During follicular phase of the menstrual cycle, the primary follicles in the ovary grow to become a fully mature Graafian follicle.
Statement II:	During follicular phase of the menstrual cycle, the endometrium of uterus regenerates through proliferation.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

74 Consider the given two statements:

Assertion (A):	Estrogen is important in the preovulatory phase of the menstrual cycle.
Reason (R):	Estrogen helps endometrium regeneration through proliferation and is responsible for LH surge.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

75 The changes in the ovary and the uterus during menstrual cycle are induced by changes in the levels of pituitary and ovarian hormones, where:

I:	The secretion of gonadotropins (LH and FSH) increases gradually during the follicular phase, and stimulates follicular development as well as secretion of estrogens by the growing follicles.
II:	Both LH and FSH attain a peak level in the middle of cycle (about 14th day).

1.	Only **I** is correct
2.	Only **II** is correct
3.	**Both I and II** are correct
4.	**Both I and II** are incorrect

76 The peak levels of LH and FSH are observed on day ______ of a typical menstrual cycle.

1.	6	2.	14
3.	22	4.	28

77 The simultaneously occurring events during the menstrual cycle are:

1.	peak of LH secretion and menstrual flow
2.	follicular development and the uterus becoming highly secretory
3.	formation of corpus Albicans and an increase in progesterone secretion
4.	Proliferation stage of the uterus and increased estrogen production

78 Which one of the following is the correct matching of the events occurring during the menstrual cycle?

	Column I	Column II
1.	Ovulation	LH and FSH attain peak levels and sharp fall in the secretion of progesterone
2.	Proliferative phase	Rapid regeneration of myometrium and maturation of Graafian follicle
3.	Development of corpus luteum	Secretory phase and increased secretion of progesterone
4.	Menstruation	Breakdown of myometrium and ovum not fertilized

79 The peak secretion of which of the following hormones does not occur just before ovulation during a normal menstrual cycle?

1.	LH	2.	FSH
3.	Progesterone	4.	Estrogen

80 For maintenance of the endometrium, the corpus luteum secretes large amounts of:

1.	oestrogen	2.	progesterone
3.	LH	4.	FSH

81 Corpus luteum is:

1. Ruptured Graafian follicle
2. Released ovum surrounded by cells
3. Developing follicle
4. Enzyme-secreting structure in the ovary

82 Consider the given two statements:

Assertion(A):	The luteal phase of the menstrual cycle is characterized by the secretion of progesterone.
Reason(R):	Progesterone is essential for the maintenance of the endometrium and preparation for possible pregnancy.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is True.

83 During pregnancy:

1.	All events of menstrual cycle stop and there is no menstruation
2.	Events of menstrual cycle continue but there is no menstruation
3.	Events of menstrual cycle continue but there is menstruation only in the first trimester
4.	All events of menstrual cycle stop and there is menstruation only in the first trimester

84 In the absence of fertilization, corpus luteum:

1.	Stops secreting progesterone but increases the secretion of estrogen
2.	Stops secreting estrogen but increases the secretion of progesterone
3.	Increases the secretion of both progesterone and estrogen
4.	Degenerates

85 The withdrawal of which of the following hormones is primarily the cause of menstrual flow in human females?

1. LH
2. FSH
3. Oestrogen
4. Progesterone

FERTILISATION AND IMPLANTATION

86 Consider the following two statements:

I:	Not all copulations lead to fertilization and pregnancy
II:	Fertilization can occur if the ovum and the sperms are simultaneously transported to the fallopian tubes.

1. Both **I** and **II** are correct and **II** correctly explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct but **II** is incorrect.
4. **I** is incorrect but **II** is correct.

87 Consider the given two statements:

Assertion (A):	Fertilisation occurs in the ampullary region of the oviduct.
Reason (R):	Ampulla is the widest region of the oviduct.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**
2.	Both **(A)** and **(R)** are true but **(R)** does not explain **(A)**.
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

88 Where does fertilization typically occur in the human female reproductive tract?

1. Fundus of Uterus
2. Cervix
3. Ampulla of Fallopian tube
4. Vagina

89 When sperm comes in contact with the zona pellucida:

1.	The secondary oocyte completes meiosis II
2.	Steps are taken to prevent polyspermy
3.	Zona pellucida ruptures and the oocyte is hatched that can be fertilized
4.	The sperm loses its tail and body

90 Zona pellucida:

I:	prevents polyspermy
II:	gets degenerated immediately following the fertilisation of secondary oocyte

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

91 Polyspermy and ectopic pregnancy in fallopian tubes are prevented by:

1. Zona pellucida
2. Coronal radiata
3. Cumulus oophorus
4. syncytiotrophoblast

92 Consider the given two statements:

Assertion (A):	The acrosome reaction is essential for fertilization in humans.
Reason (R):	The acrosome contains digestive enzymes that help the sperm penetrate the corona radiata and zona pellucida to reach the oocyte.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

93 What happens when a sperm enters the cytoplasm of the secondary oocyte?

1. Release of first polar body
2. Completion of meiosis II
3. Degeneration of polar bodies
4. Dissolution of zona pellucida

94 The mitotic division in the zygote:

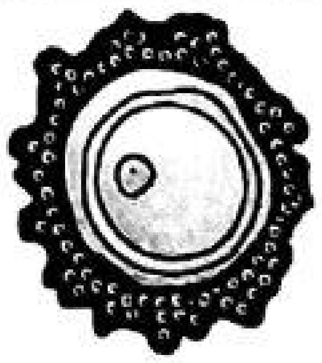
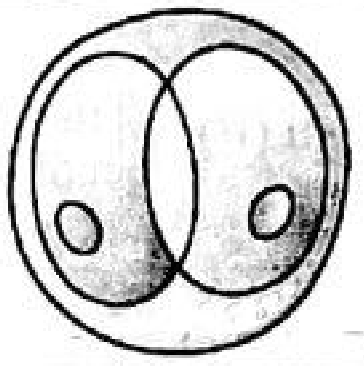
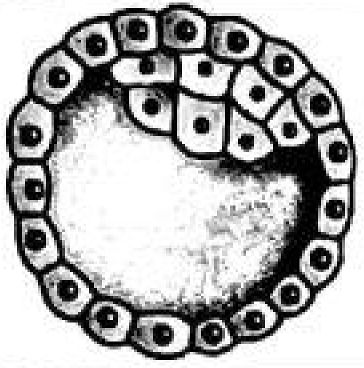
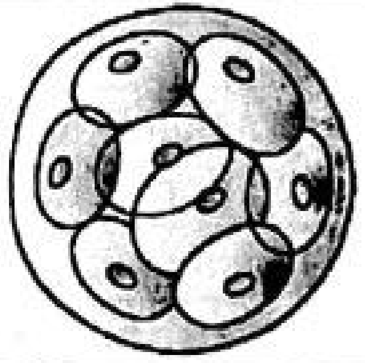
I:	starts when the zygote reaches the uterine fundus
II:	are called cleavage divisions
III:	results in daughter cells called blastomeres

1.	Only **I** and **II** are correct	2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct	4.	**I, II** and **III** are correct

95 The embryo with 8 to 16 blastomeres is called a:

1.	Morula	2.	Blastula
3.	Blastocyst	4.	Gastrula

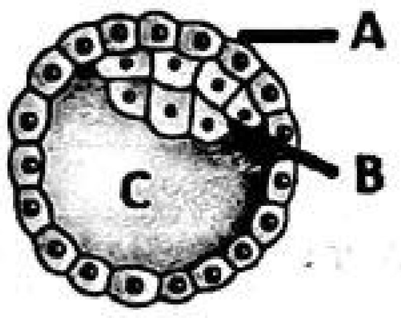
96 At implantation, which of the following becomes embedded in the endometrium of the uterus leading to pregnancy?

1.		2.	
3.		4.	

97 Implantation in humans occurs at the stage of:

1.	Zygote	2.	Morula
3.	Blastocyst	4.	Gastrula

98 Identify the incorrect statement regarding the structure shown in the given figure:



1. It is a morula.
2. A gets attached to the endometrium.
3. B gets differentiated as the embryo.
4. C is blastocoel

99 Consider the given two statements:

Statement I:	The blastomeres in the blastocyst are arranged into an inner layer called trophoblast and an outer group of cells attached to trophoblast called the outer cell mass.
Statement II:	The outer cell mass then gets attached to the myometrium and the trophoblast cells get differentiated as the embryo.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

100 During embryonic development:

1.	the trophoblast cells help in the formation of the placenta and inner cell mass differentiates into the embryo
2.	the trophoblast cells differentiate into the embryo and inner cell mass helps in the formation of the placenta
3.	the trophoblast cells help in the formation of the placenta and both trophoblast cells and inner cell mass differentiate into the embryo
4.	the trophoblast cells help in the formation of the placenta and differentiate into the embryo as well

PREGNANCY AND EMBRYONIC DEVELOPMENT

101 Chorionic villi are finger-like projections that appear, after implantation, on:
1. the inner cell mass
2. the trophoblast
3. the decidua
4. the embryonic endoderm

102 Which part of the ovary in mammals acts as an endocrine gland after ovulation?

1.	Graafian follicle	2.	Stroma
3.	Germinal epithelium	4.	Vitelline membrane

103 How many of the given statements regarding human placenta are correct?

I:	It is formed only by the maternal tissue.
II:	It facilitates the supply of oxygen and nutrients to the embryo and also removal of carbon dioxide and excretory/waste materials produced by the embryo.
III:	The placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo.
IV:	Placenta allows mixing of maternal blood and foetal blood from the middle of the pregnancy.

1.	1	2.	2
3.	3	4.	4

104 During pregnancy, placenta also acts as an endocrine tissue and produces several hormones which do not include:

1. human chorionic gonadotropin (hCG)
2. human placental lactogen (hPL)
3. progestogens
4. thyroxine

105 The placenta is connected to the embryo through:

1.	Ligaments	2.	Portal vein
3.	Umbilical cord	4.	Mesentery

106 Consider the given statements:

I:	In the later phase of pregnancy, a hormone called relaxin is also secreted by the ovary.
II:	hCG, hPL and relaxin are produced in women only during pregnancy.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

107 Which of the following is not produced in the woman only during pregnancy?

1.	hCG	2.	hPL
3.	Relaxin	4.	Oxytocin

108 Consider the given two statements:

Assertion (A):	During pregnancy the levels of other hormones like estrogens, progestogens, cortisol, prolactin, thyroxine, etc., are increased several-folds in the maternal blood.
Reason (R):	Increased production of these hormones is essential for supporting the fetal growth, metabolic changes in the mother and maintenance of pregnancy.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is true

109 Consider the given two statements:

Statement I:	The three germ layers [ectoderm, mesoderm and endoderm] give rise to all tissues (organs) in adults.
Statement II:	The inner cell mass contains certain cells called stem cells which have the potency to give rise to all the tissues and organs.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

110 Which embryonic layer is the last to appear during embryonic development in humans?

1. Ectoderm
2. Mesoderm
3. Endoderm
4. Epiblast

111 In human beings, the embryo heart is formed about after ________ of pregnancy.

1.	One month	2.	Two months
3.	First trimester	4.	Second trimester

112 Identify the incorrectly matched pair:

I:	The embryo's heart is formed	After one month of pregnancy
II:	Limbs and external genital organs are well-developed	By the end of the second month of pregnancy
III:	First movements of the foetus	During the fifth month

1. Only **I** and **III**
2. Only **II**
3. Only **III**
4. Only **I** and **II**

113 How many of the given statements regarding human embryonic development at various months of pregnancy are correct?

I:	After one month of pregnancy, the embryo's heart is formed.
II:	The first sign of growing foetus may be noticed by listening to the heart sound carefully through the stethoscope after one month.
III:	By the end of the second month of pregnancy, the foetus develops limbs and digits.
IV:	By the end of 12 weeks (first trimester), most of the major organ systems are formed.
V:	The first movements of the foetus and appearance of hair on the head are usually observed during the fifth month.
VI:	By the end of about 24 weeks (end of second trimester), the body is covered with fine hair, eye-lids separate, and eyelashes are formed.

1.	3	2.	4
3.	5	4.	6

PARTURITION AND LACTATION

114 The process of delivery of the fetus [childbirth] is called as:

1.	Gestation	2.	Implantation
3.	Insemination	4.	Parturition

115 The foetal ejection reflex is:

1.	a pure neural reflex	2.	a pure endocrine reflex
3.	a neuro-endocrine reflex	4.	not a reflex

116 The signals for parturition originate from:

1. Maternal pituitary
2. Maternal hypothalamus
3. Fully developed foetus and placenta
4. Maternal ovary

117 To induce uterine contractions for parturition, which of the following hormones can be injected into the female?

1.	hCG	2.	Estrogen
3.	Progesterone	4.	Oxytocin

118 Consider the given two statements:

Assertion (A):	The inadequacy of the secretion of oxytocin may interfere with the process of parturition.
Reason (R):	Oxytocin is a peptide hormone synthesised and secreted by pituitary gland.

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

119 Consider the given two statements:

Statement I:	The mode of secretion of oxytocin at parturition is one of the rare examples of positive feedback in humans.
Statement II:	Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

120 Consider the given two statements:

Assertion (A):	Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby.
Reason (R):	The milk produced during the initial few days of lactation is called colostrum.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	**(A)** is False but **(R)** is True.

121 The milk produced during the initial few days of lactation is called colostrum, which contains several antibodies, especially of the class:

1.	IgA	2.	IgG
3.	IgM	4.	IgE

HUMAN REPRODUCTION - ANSWER KEY

1.	(3)	2.	(3)	3.	(2)	4.	(3)	5.	(4)	6.	(3)	7.	(1)	8.	(3)	9.	(1)	10.	(4)
11.	(2)	12.	(1)	13.	(3)	14.	(4)	15.	(1)	16.	(1)	17.	(2)	18.	(1)	19.	(3)	20.	(3)
21.	(1)	22.	(2)	23.	(3)	24.	(1)	25.	(4)	26.	(2)	27.	(2)	28.	(2)	29.	(4)	30.	(1)
31.	(3)	32.	(1)	33.	(1)	34.	(1)	35.	(1)	36.	(4)	37.	(3)	38.	(1)	39.	(2)	40.	(3)
41.	(3)	42.	(1)	43.	(1)	44.	(3)	45.	(1)	46.	(2)	47.	(4)	48.	(3)	49.	(3)	50.	(3)
51.	(1)	52.	(1)	53.	(4)	54.	(3)	55.	(3)	56.	(3)	57.	(1)	58.	(2)	59.	(2)	60.	(4)
61.	(1)	62.	(2)	63.	(4)	64.	(3)	65.	(1)	66.	(3)	67.	(4)	68.	(3)	69.	(1)	70.	(4)
71.	(4)	72.	(1)	73.	(1)	74.	(1)	75.	(3)	76.	(2)	77.	(4)	78.	(3)	79.	(3)	80.	(2)
81.	(1)	82.	(1)	83.	(1)	84.	(4)	85.	(4)	86.	(1)	87.	(2)	88.	(3)	89.	(2)	90.	(1)
91.	(1)	92.	(1)	93.	(2)	94.	(3)	95.	(1)	96.	(3)	97.	(3)	98.	(1)	99.	(4)	100.	(1)
101.	(2)	102.	(1)	103.	(2)	104.	(4)	105.	(3)	106.	(3)	107.	(4)	108.	(1)	109.	(3)	110.	(2)
111.	(1)	112.	(2)	113.	(4)	114.	(4)	115.	(3)	116.	(3)	117.	(4)	118.	(3)	119.	(1)	120.	(1)
121.	(1)																		

INTRODUCTION

1 Consider the given two statements:

Statement I:	A society with people having physically and functionally normal reproductive organs and normal emotional and behavioural interactions among them in all sex-related aspects might be called reproductively healthy.
Statement II:	According to the World Health Organisation (WHO), reproductive health means a total well-being in all aspects of reproduction, i.e., physical, emotional, behavioural and social.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is incorrect; **Statement II** is incorrect
3.	**Statement I** is correct; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is correct

REPRODUCTIVE HEALTH – PROBLEMS AND STRATEGIES

2 India was amongst the first countries in the world to initiate action plans and programmes at a national level to attain total reproductive health as a social goal. Which of the following statement(s) is/are correct?

Statement I:	These programmes called 'family planning' were initiated in 1971.
Statement II:	Improved programmes are currently in operation under the popular name 'Reproductive and Child Health Care (RCH) programmes'.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

3 What does RCH stand for?

1.	Reproductive and Complete Health
2.	Regional and Central Healthcare
3.	Reproductive and Child Healthcare
4.	Reproductive and Cumulative Health

4 Consider the given two statements:

Assertion (A):	Introduction of sex education in schools should be encouraged to provide right information to the young.
Reason (R):	Providing right information to the young will discourage children from believing in myths and having misconceptions about sex-related aspects.

1.	**(A)** is True; **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	**(A)** is False; **(R)** is true
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**

5 All the following measures will be helpful for building up a reproductively healthy society except:

1.	Introduction of sex education in schools
2.	Educating people, especially fertile couples and those in marriageable age group, about available birth control options
3.	Promoting the use of pre-natal sex determination techniques like amniocentesis
4.	Encouragement and support by governmental and non-governmental agencies to research various reproduction-related areas

6 The introduction of sex education in schools in India should be encouraged. This is because:

I:	This will discourage children from believing in misconceptions about sex-related aspects
II:	Sex education will help adolescents to lead a reproductively healthy life

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

7 To address the importance of bringing up socially conscious healthy families of desired size, all the following
strategies will be helpful except

1.	Educating people, especially fertile couples and those in marriageable age group, about available birth control options
2.	Care of pregnant mothers, post-natal care of the mother and child, importance of breast feeding
3.	Equal opportunities for the male and the female child
4.	Allowing pre-natal sex determination so that couple can select the sex of the child

8 Amniocentesis cannot be used in the prenatal diagnosis of:

1.	Hypothyroidism	2.	Sickle cell anemia
3.	Trisomy 21	4.	Klinefelter's syndrome

9 Consider the given two statements:

Assertion (A):	India has made prenatal sex determination illegal.
Reason (R):	Amniocentesis can be misused for pre-natal sex determination.

1.	**(A)** is false but **(R)** is True
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True bur **(R)** is False.

10 The Central Drug Research Institute [CDRI] is located at:

1.	Lucknow	2.	New Delhi
3.	Hyderabad	4.	Pune

POPULATION STABILISATION AND BIRTH CONTROL

11 The population of India:

I:	was approximately 350 million at the time of our independence.
II:	reached close to the two billion mark by 2000.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

12 The most important step to overcome the problem of an increasing population size in India must be to:

1.	motivate smaller families by using various contraceptive methods.
2.	deny people with more than two kids, any government subsidies or support.
3.	increase GDP to such levels that an increasing population ceases to be an issue.
4.	forcibly enforce one child norm.

13 If IMR [Infant Mortality Rate] and MMR [Maternal Mortality rate] in a population are decreased, the population will most likely show:

1. an increase in growth rate
2. a decline in growth rate
3. a negative growth rate
4. no change in growth rate

14 What is the primary goal of family planning programs?

1.	To decrease infant mortality.
2.	To control the population growth.
3.	To increase the age of marriage.
4.	To provide prenatal care.

15 Which of the following is not a factor that has led to a population explosion in India?

1.	Decline in death rate
2.	Decline in maternal mortality rate
3.	Decline in Infant mortality rate
4.	Decline in the number of people in reproducible age

16 The contemporary increase in the size of the population of India is caused by a rapid decline in:

I:	death rate
II:	maternal mortality rate (MMR)
III:	infant mortality rate (IMR)
IV:	number of people in reproducible age

1.	Only **I, II** and **III**	2.	Only **I, III** and **IV**
3.	Only **II, III** and **IV**	4.	**I, II, III** and **IV**

17 Consider the given two statements:

Assertion (A):	The government in India has been forced to take up serious measures to check population growth rate.
Reason (R):	An alarming growth rate could lead to an absolute scarcity of even the basic requirements for our citizens.

1.	**(A)** is False but **(R)** is True
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True but **(R)** is False.

18 Statutory marriageable age in India:

1.	is 18 years for both males and females.
2.	is 21 years for both males and females.
3.	is 18 years for females and 21 years for males.
4.	is 18 years for males and 21 years for females.

19 An ideal contraceptive should have all the features except:

I:	It should be user-friendly, easily available, effective and reversible with no or least side-effects.
II:	It also should interfere with the sexual drive, desire and/or the sexual act of the user thereby reducing the fertility of the user.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

20 Regarding natural methods of contraception:

I:	As no medicines or devices are used in these methods, side effects are almost nil.
II:	Chances of failure are almost nil as they have very high efficiency value.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

21 Natural methods for contraception work on the principle of:

1.	Preventing fertilization
2.	Preventing implantation
3.	Preventing ovulation
4.	Preventing embryo development

22 Consider the given two statements:

Assertion (A):	In periodic abstinence, the couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle.
Reason (R):	Chances of fertilisation are very high during this period and it is called the fertile period.

1.	**(A)** is False but **(R)** is True
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True but **(R)** is False

23 The lactational amenorrhea method of contraception is based on the fact that:

1.	Ovulation and menstrual flow does not occur post-conception during intense lactation
2.	he cervix mucus becomes hostile to sperms after parturition during intense lactation
3.	Ovulation and menstrual flow does not occur postpartum during intense lactation
4.	The endometrium is reabsorbed rather than sloughed off during intense lactation

24 Amenorrhea is:

1.	Abnormal menstruation	2.	Excess menstruation
3.	Absence of menstruation	4.	Scanty menstruation

25 Lactational amenorrhea is effective up to a maximum period of:

1.	3 months	2.	6 months
3.	9 months	4.	12 months

26 Barrier methods for contraception work on the principle of:

1. Preventing fertilization
2. Preventing implantation
3. Preventing ovulation
4. Preventing embryo development

27 A major non-contraceptive advantage of male barrier contraceptives is that they prevent:

1.	Cancer breast	2.	STI
3.	Ectopic pregnancies	4.	Menstrual irregularities

28 Which of the following barrier contraceptives are not exclusive for use in females?

1.	Diaphragms	2.	Cervical caps
3.	Vaults	4.	Condoms

29 To increase their contraceptive efficiency, the barrier contraceptives in females are used with:

1.	IUDs	2.	OCPs
3.	Spermicidal chemicals	4.	Implants

30 Consider the given two statements:

Assertion (A):	Spermicidal creams, jellies and foams are usually used along with the barrier contraceptives.
Reason (R):	Barrier contraceptives do not have a very high efficiency when compared to IUDs or OCPs.

1.	**(A)** is False but **(R)** is True
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True but **(R)** is False

31 Diaphragms, contraceptive devices used by the females, are

I: introduced into the uterus
II: placed to cover the cervical region
III: act as physical barriers for sperm entry
IV: act as spermicidal agents

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. Only **III** & **IV** are correct

32 Consider the given two statements:

Assertion (A):	Use of male barrier contraceptive is a safeguard against AIDS and sexual diseases besides checking pregnancy.
Reason (R):	Male barrier contraceptives act as physical barriers and prevent body fluid of two partners from coming into contact.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

33 Which of the following IUDs is non-medicated?

1.	Lippes loop	2.	Cu – T
3.	Cu – 7	4.	LNG – 20

34 Suppression of sperm motility and their fertilizing capacity is the specific mechanism of action of:

1.	Lippes loop	2.	Multiload 375
3.	LNG 20	4.	Progestasert

35 The hormonal IUD, LNG-20, releases:

1.	Progesterone	2.	Estrogen
3.	FSH	4.	LH

36 Multi load – 375 is a:

1.	Barrier contraceptive	2.	Cu releasing IUD
3.	Hormonal IUD	4.	Hormonal sub-dermal implant

37 The ideal contraceptive for females who want to delay pregnancy and/or space children is:

1.	Barrier contraceptive	2.	Periodic abstinence
3.	IUD	4.	Hormonal pills

38 The main mechanism of action of Cu released from Cu releasing IUD is:

1.	Increased phagocytosis of sperms in the uterus
2.	Suppression of sperm motility
3.	Early degeneration of the released ovum
4.	Making the uterus unsuitable for implantation

39 Which of the following is not a mechanism of action of IUDs as contraceptives?

1.	IUDs increase phagocytosis of sperms within the uterus.
2.	IUDs prevent ovulation.
3.	Cu ions released by certain IUDs suppress sperm motility and the fertilizing capacity of sperm.
4.	The hormone-releasing IUDs, in addition, make the uterus unsuitable for implantation and the cervix hostile to the sperm.

40 The primary mechanism by which the combination of oral contraceptive pills prevents pregnancy is by:

1.	preventing ovulation
2.	causing follicular atresia
3.	preventing implantation
4.	causing an increase in sperm mortality in the birth canal

41 Oral contraceptive combination pills:

I:	Inhibit ovulation
II:	May prevent implantation
III:	Retard passage of sperms through the cervix

1.	Only **I** and **II** are correct
2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct
4.	**I, II** and **III** are correct

42 Consider the given two statements:

Assertion (A):	Oral Pills have to be taken daily for a period of 21 days starting preferably within the first five days of menstrual cycle.
Reason (R):	After a gap of 7 days (during which menstruation occurs) it has to be repeated in the same pattern till the female desires to prevent conception.

1.	**(A)** is False but **(R)** is True
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True but **(R)** is False

43 "Saheli" is a:

1.	NGO working for female child rights
2.	Mid-wife working in villages to help with child immunization
3.	A national helpline number for the prevention of crimes against women
4.	New oral contraceptive for females

44 What is incorrect regarding the oral contraceptive 'Saheli' produced by CDRI, Lucknow?

1.	Once a week pill	2.	Contains steroids
3.	Very few side effects	4.	High contraceptive value

45 Regarding 'Saheli':

I:	It is a steroidal oral contraceptive pill developed by CDRI
II:	It has very few side effects and high contraceptive value

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

46 Selective estrogen receptor modulator that causes asynchrony between ovarian and uterine events, and is used as once a week non-steroidal oral contraceptive pill, contains:

1.	Only progesterone
2.	Combination of synthetic estrogen and progesterone
3.	RU 486
4.	Ormeloxifene

47 Which of the following is not a preferred method employed for emergency contraception?

1.	Administration of progestogens
2.	Administration of estrogens
3.	Administration of a progestogen-estrogen combination
4.	Insertion of an IUD

48 Emergency contraceptive methods must be employed within:

1.	72 hours of ovulation
2.	72 hours of the onset of menstrual flow
3.	72 hours of unprotected coitus
4.	72 hours of cessation of menstrual flow

49 A high success rate of preventing pregnancy by the insertion of IUD as an emergency contraceptive within 72 hours of coitus suggests that:

1.	There is a latency between the release of the ovum and it getting ready for fertilization
2.	The journey from the point of insemination to the site of fertilization is very long for a very small-sized sperm and takes considerable time.
3.	IUDs may also make the uterine endometrium hostile to implantation.
4.	If the secretion of hCG by the trophoblast cells can be stopped, it will lead to spontaneous abortion as happens due to the insertion of IUDs.

50 Identify the incorrect statement regarding surgical birth control methods:

1.	They are also called as "sterilization" procedures
2.	In males vasectomy and in females tubectomy is advised
3.	They are terminal methods to prevent any more pregnancies
4.	These methods are hugely popular all over the world

51 A male who has undergone vasectomy would be:

1.	sterile	2.	unable to produce sex hormones
3.	impotent	4.	castrated

52 Consider the two statements:

I:	When the vasectomy is complete the testes stop sperm production.
II:	Post vasectomy there is a significant drop in testosterone levels.

1.	Both **I** and **II** are correct and **II** explains **I**.
2.	Both **I** and **II** are correct but **II** does not explain **I**.
3.	**I** is correct but **II** is incorrect.
4.	Both **I** and **II** are incorrect.

53 The main drawback of the surgical methods for birth control is:

1.	They are poorly reversible
2.	They are very expensive
3.	Postoperative rest period is very long
4.	The surgery carries great risks of morbidity and mortality

54 Which accessory sex duct is cut and ligated during the vasectomy procedure?

1.	Vasa efferentia	2.	Vas deferens
3.	Epididymis	4.	Prostatic urethra

MEDICAL TERMINATION OF PREGNANCY (MTP)

55 Medical Termination of Pregnancy is:

1.	Legalized abortion
2.	Surgical method for sterilisation
3.	Most common contraceptive strategy used in our country
4.	Abortions due to negligence of medical professionals

56 The government of India legalized MTP in:

1.	1951	2.	1971
3.	1975	4.	1977

57 Which of the following will not be a valid ground for Medical Termination of Pregnancy under the Medical Termination of Pregnancy (Amendment) Act, 2017?

1.	The continuation of the pregnancy would involve a risk to the life of the pregnant woman or of grave injury to physical or mental health.
2.	There is a substantial risk that if the child were born, it would suffer from such physical or mental abnormalities as to be seriously handicapped.
3.	Prenatal sex determination has determined the foetus to be female.
4.	Pregnancy as a result of sexual assault.

58 According to The Medical Termination of Pregnancy (Amendment) Act, 2017:

I:	a pregnancy may be terminated on certain considered grounds within the first 12 weeks of pregnancy on the opinion of one registered medical practitioner.
II:	if the pregnancy has lasted more than 12 weeks, but fewer than 24 weeks, two registered medical practitioners must be of the opinion, formed in good faith, that the required ground exists.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

59 Second Trimester Medical Termination of Pregnancy in India

1.	is not allowed at all
2.	is allowed on the opinion of a single registered medical practitioner
3.	needs approval of two separate registered medical practitioners
4.	is easily carried out by non-surgical methods

60 MTPs are considered relatively safe:

1. during the first trimester
2. during the second trimester
3. during the third trimester
4. any time during pregnancy

61 An ultrasound examination at 18 weeks of pregnancy reveals gross structural deformities in the skull and head of the fetus making it highly likely that the newborn will be suffering from severe mental abnormalities not amenable to treatment and is likely to have a very short life span. Which of the following will be true for such a situation?

1.	The pregnancy cannot be legally terminated as 18 weeks is beyond the statutory limit of legalized abortions.
2.	The couple should be advised to get the MTP performed illegally by a quack as the child will suffer whatever short life it may have.
3.	The pregnancy must continue till 24 weeks and if a repeat examination confirms the conditions, MTP should be performed as then it would be legal.
4.	The MTP should be advised to the couple if two separate registered medical practitioners share the view that sufficient grounds exist to terminate the pregnancy.

62 Consider the following four statements regarding MTP:

I:	MTPs are generally advised during first trimester
II:	MTPs are used as a regular contraceptive method
III:	MTPs are always surgical
IV:	MTPs require the assistance of qualified medical personnel

1. II and III are correct
2. I and III are correct
3. I and IV are correct
4. I and II are correct

SEXUALLY TRANSMITTED INFECTIONS (STIs)

63 Which of the following sexually transmitted infections is completely curable if diagnosed and treated early?

1.	Hepatitis B	2.	Syphilis
3.	Genital herpes	4.	HIV

64 The incidence of sexually transmitted infections is reported to be very high among persons in the age group of:

1.	15 – 24 years
2.	25 – 34 years
3.	35 – 44 years
4.	45 – 54 years

65 Which of the following is not useful in the prevention of the spread of STDs?

1.	Avoid sex with unknown partners/ multiple partners
2.	Use of condoms during coitus
3.	Early diagnosis and treatment
4.	Use of IUDs

66 Which of the following is correct regarding HIV, hepatitis B, gonorrhoea, and trichomoniasis?

1.	Trichomoniasis is an STD whereas others or not.
2.	Gonorrhoea is a viral disease whereas others are bacterial.
3.	HIV is a pathogen whereas others are diseases.
4.	Hepatitis B has been eradicated completely whereas others have not.

67 In females, Pelvic Inflammatory Diseases [PID] are frequently the complication of:

1. Streptococcal skin infections
2. Sexually transmitted infections
3. Twin pregnancy
4. Tubectomy surgical procedure

68 How many of the diseases given below will be included under bacterial sexually transmitted infections?

Gonorrhoea, Syphilis, Genital herpes, Chlamydiasis, Genital warts, Trichomoniasis, Hepatitis-B, HIV

1. 1
2. 2
3. 3
4. 4

69 The causative agent of the STI Genital warts is:

1. HIV retrovirus
2. Human papillomaviruses
3. *Neisseria gonorrhoeae*
4. *Chlamydia trachomatis*

70 How many of the Sexually Transmitted Infections given in the box are caused by viral pathogens?

Syphilis, Genital warts, Genital herpes, Gonorrhoea, AIDS, Trichomoniasis

1.	3	2.	4
3.	5	4.	6

71 Regarding Sexually Transmitted Infections [STI]:

I:	Some of them may be transmitted without sexual contact as well.
II:	All STIs are incurable.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 Spirochete Treponema pallidum is the causative agent of which of the following sexually transmitted infections?

1. Syphilis
2. Gonorrhea
3. Chlamydia
4. Genital herpes

INFERTILITY

73 The inability to conceive or produce children even after ____ years of unprotected sexual co-habitation is called infertility.

1.	1	2.	2
3.	3	4.	4

74 ART [used to help infertile couples] stands for:

1.	Assisted Reproductive Technologies
2.	Artificial Reproductive Technologies
3.	Augmented Reproductive Technologies
4.	Anomalous Reproductive Technologies

75 In the 'test–tube baby' procedure:

1.	Fertilization is in-vitro but embryo development is in-vivo
2.	Fertilization is in-vivo but embryo development is in-vitro
3.	Both fertilization and embryo development are in-vitro
4.	Both fertilization and embryo development are in-vivo

76 What is transferred into the fallopian tube in ZIFT?

1.	Zygote only
2.	Embryos with more than 8 blastomeres
3.	Zygote or embryos with up to 8 blastomeres
4.	All of the above can be transferred during ZIFT

77 ART in which a sperm is directly injected into the ovum is known as:

1.	ZIFT	2.	GIFT
3.	SUZI	4.	ICSI

78 Transfer of an ovum collected from a donor into the fallopian tube of another female is called as:

1.	ZIFT	2.	GIFT
3.	SUZI	4.	ICSI

79 Match each item in Column I with one in Column II and select your answer from the codes given:

Column I	**Column II**
A. IUI	a. injection of washed sperm into the uterus with a catheter
B. ZIFT	b. an egg fertilized in vitro (outside the body) is placed into a woman's fallopian tube
C. GIFT	c. eggs are removed from a woman's ovaries, and placed in one of the Fallopian tubes, along with the man's sperm
D. ICSI	d. injection of a single sperm directly into a mature egg

Codes :

	A	B	C	D
1.	a	b	c	d
2.	d	b	c	a
3.	a	c	b	d
4.	d	c	b	a

80 Impotence in males and oligospermia leading to infertility can be helped by:

1.	AI	2.	GIFT
3.	Sperm donation	4.	Surrogacy

81 Artificial insemination means:

1.	transfer of sperms of a healthy donor to a test tube containing ova
2.	transfer of sperms of husband to a test tube containing ova
3.	artificial introduction of sperms of a healthy donor into the vagina
4.	introduction of sperms of healthy donor directly into the ovary

82 In test tube baby programme:

I:	ova from the wife/donor (female) and sperms from the husband/donor (male) are collected and are induced to form zygote under simulated conditions in the laboratory.
II:	the zygote or early embryos (with upto 8 blastomeres) could then be transferred into the fallopian tube.
III:	Embryos with more than 8 blastomeres, can be transferred into the uterus to complete its further development.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

83 ICSI stands for:

1. Intra Cytoplasmic Sperm Injection
2. Intra Cytoplasmic Sperm Insemination
3. In-vitro Cytoplasmic Sperm Injection
4. In-vivo Cytoplasmic Sperm Insemination

84 Identify the pair where the expanded form is incorrect for the abbreviation given:

1.	ICSI	Intra Cytoplasmic Sperm Injection
2.	ZIFT	Zygote Intra Fallopian Transfer
3.	ART	Artificial Reproductive Technologies
4.	IUI	Intra-Uterine Insemination

REPRODUCTIVE HEALTH - ANSWER KEY

1.	(3)	2.	(2)	3.	(3)	4.	(2)	5.	(3)	6.	(3)	7.	(4)	8.	(1)	9.	(3)	10.	(1)
11.	(1)	12.	(1)	13.	(1)	14.	(2)	15.	(4)	16.	(1)	17.	(2)	18.	(3)	19.	(2)	20.	(1)
21.	(1)	22.	(2)	23.	(3)	24.	(3)	25.	(2)	26.	(1)	27.	(2)	28.	(4)	29.	(3)	30.	(2)
31.	(3)	32.	(1)	33.	(1)	34.	(2)	35.	(1)	36.	(2)	37.	(3)	38.	(2)	39.	(2)	40.	(1)
41.	(4)	42.	(3)	43.	(4)	44.	(2)	45.	(2)	46.	(4)	47.	(2)	48.	(3)	49.	(3)	50.	(4)
51.	(1)	52.	(4)	53.	(1)	54.	(2)	55.	(1)	56.	(2)	57.	(3)	58.	(3)	59.	(3)	60.	(1)
61.	(4)	62.	(3)	63.	(2)	64.	(1)	65.	(4)	66.	(3)	67.	(2)	68.	(3)	69.	(2)	70.	(1)
71.	(1)	72.	(1)	73.	(2)	74.	(1)	75.	(1)	76.	(3)	77.	(4)	78.	(2)	79.	(1)	80.	(1)
81.	(3)	82.	(4)	83.	(1)	84.	(3)												

PRINCIPLES OF INHERITANCE AND VARIATION

INTRODUCTION

1 Match each item in Column I with one in Column II and select your answer from the codes given:

	Column I		Column II
	Scientist		**Contribution**
A.	Francis Crick	a.	Breaking the genetic code
B.	Nirenberg	b.	Established Coenorhabditiselegans as a model genetics study organism
C.	Benzer	c.	Central dogma of molecular biology
D.	Brenner	d.	Bacteriophage genetics

Codes:

	A.	B.	C.	D.
1.	c	a	d	b
2.	c	a	b	d
3.	a	b	c	d
4.	a	c	d	b

2 Which of the following father and son duos received Nobel Prize?

1.	Nirenbergs	2.	Kornbergs
3.	Darwins	4.	Lederbergs

3 The famous double helix model of DNA was proposed by Watson and Crick in ____ and they shared Nobel Prize for Physiology or Medicine in ________ for their effort.

1.	1951, 1971	2.	1943, 1963
3.	1953, 1962	4.	1969, 1972

4 The branch of biology that deals with inheritance, as well as the variation of characters from parents to offspring, is called as:

1.	Evolution	2.	Genetics
3.	Developmental biology	4.	Forensics

5 Genetics deals with:

I:	the process by which characters are passed on from parent to progeny.
II:	the degree by which progeny differ from their parents.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

MENDEL'S LAW OF INHERITANCE

6 Identify the incorrect statement regarding experiments on *Pisum sativum* by Gregor Mendel:

1.	He conducted hybridisation experiments on garden peas for seven years (1856-1863) and proposed the laws of inheritance in living organisms.
2.	It was for the first time that statistical analysis and mathematical logic were applied to problems in biology.
3.	Unfortunately his experiments had a small sampling size, which gave less credibility to the data that he collected.
4.	He investigated characters in the garden pea plant that were manifested as two opposing traits.

7 A plant, on repeated self-pollination, preserves the trait expressed for many generations. Such a plant is said to be:

1.	Panmictic	2.	Homologous
3.	Apomictic	4.	Pure line

8 In Pisum sativum, which of the following is not a dominant trait?

1. Violet flower color
2. Yellow pod color
3. Axial flower position
4. Tall stem height

9 Match the following traits with their dominant form in *Pisum sativum*:

	Column I		Column II
A.	Flower Color	1.	Yellow
B.	Seed Shape	2.	Inflated
C.	Seed Color	3.	Round
D.	Pod Shape	4.	Purple

1. A-4, B-3, C-1, D-2
2. A-1, B-2, C-4, D-3
3. A-4, B-2, C-1, D-3
4. A-1, B-3, C-4, D-2

10 Which of the following is a recessive trait in garden pea plants studied by Mendel?

1. Tallness
2. Yellow seeds
3. Round seeds
4. Green seed color

INHERITANCE OF ONE GENE

11 Consider the given two statements:

Assertion(A):	In his monohybrid cross experiments on Garden Pea, Mendel found that the F_1 always resembled either one of the parents, and that the trait of the other parent was not seen in them.
Reason(R):	There was blending of the unit factors in F_1 plants.

1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

12 In Mendel's experiments, the contrasting traits did not show any blending in:

1.	F_1 stage
2.	F_2 stage
3.	Both F_1 and F_2 stages
4.	The statement is false as blending was seen at all stages

13 The units of inheritance according to Mendel were 'factors'. Today these factors are known as:

1.	Gametes	2.	DNA
3.	Genes	4.	RNA

14 Genes that code for a pair of contrasting traits or slightly different forms of the same gene are known as:

1.	Alleles	2.	Loci
3.	Cistrons	4.	Introns

15 In true breeding, the allelic pair of genes are:

1.	Homologous	2.	Linked
3.	Stable	4.	Homozygous

16 What could be the genotype of a garden pea plant that expresses the tall trait of height?

1.	TD	2.	Tt
3.	Td	4.	tt

17 In a dissimilar situation, the unit factor that expresses itself is called as:

1.	Dominant	2.	Recessive
3.	Epistatic	4.	Hypostatic

18 A plant with the genotype Tt should be called:

1.	Heterologous	2.	Hemizygous
3.	Heterozygous	4.	Dihybrid

19 A genetic cross between homozygous individuals but with different alleles for a single gene of interest is called as:

1.	A reciprocal cross	2.	Monohybrid cross
3.	Dihybrid cross	4.	Test cross

20 Identify the incorrect statement:

1.	Tall plant produces gametes by meiosis and the dwarf plant by mitosis.
2.	Only one allele is transmitted to a gamete.
3.	This segregation of alleles is a random process.
4.	Gametes will always be pure for the trait.

21 A heterozygous plant produces:

1.	Only one kind of gamete
2.	Two kinds of gametes, each having one allele with equal proportion.
3.	Two kinds of gametes, each having two alleles with equal proportions.
4.	Two kinds of gametes, each having one allele, with one allele occurring in more gametes than the other.

22 What would you call an organism with two copies of the same allele?

1. homologous for the allele
2. heterologous for the allele
3. homozygous for the trait
4. heterozygous for the trait

23 A graphical representation to calculate the probability of all possible genotypes of offspring in a genetic cross is called as:

1.	Forked line diagram	2.	Punnett square
3.	Pedigree chart	4.	Idiogram

24 What proportion of progeny in F_2 generation in a Mendel monohybrid cross resembled the parent [of P generation] that expressed the recessive trait?

1.	¼	2.	½
3.	¾	4.	2/3

25 The F_2 genotypic ratio of a monohybrid cross is:

1.	1 : 1	2.	3 : 1
3.	1 : 2 : 1	4.	9 : 7

26 On self-pollinated a tall F_2 plant, the progeny can be:

1.	Tall only	2.	Dwarf only
3.	Intermediate in height	4.	Tall and Dwarf

27 A test cross is done to find out:

1.	Fitness of an organism
2.	Genotype of a plant expressing dominant phenotype
3.	The suitable parents for a Mendelian Cross
4.	The hidden genotypic ratio of F_2 phenotypes

28 In a test cross, the plant expressing the dominant phenotype is crossed with the plant:

1.	Which is heterozygous dominant
2.	Which is heterozygous recessive
3.	Which is homozygous recessive
4.	Which is homozygous dominant

29 What is the ratio of a typical monohybrid test cross?

1.	2 : 1	2.	3 : 1
3.	1 : 2 : 1	4.	1 : 1

30 Consider the given two statements:

Assertion(A):	In a typical test cross an organism showing a dominant phenotype (and whose genotype is to be determined) is crossed with the organism showing recessive phenotype.
Reason(R):	There is no need to carry out a test cross to determine the genotype of an organism showing the recessive phenotype.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

31 Which of the following is not true for the Law of Dominance given by Mendel?

1.	Characters are controlled by discrete units called factors.
2.	Factors occur in pairs.
3.	In a dissimilar pair of factors, one member of the pair dominates the other.
4.	The alleles show blending at the time of fertilization.

32 The expression of only one of the parental characters in a monohybrid cross in the F_1, the expression of both in the F_2 and the proportion of 3:1 obtained at the F_2 can be explained by:

1. Law of Dominance
2. Law of segregation
3. Law of Independent Assortment
4. Two-factor interaction

33 Which statement naturally follows from the Mendel's Law of Dominance?

1.	Dominant alleles always express themselves in the phenotype
2.	Recessive alleles always express themselves in the phenotype
3.	Alleles segregate independently during gamete formation
4.	Genes assort independently during meiosis

34 The law of segregation is based on the fact that :

1. The alleles do not show any blending.
2. There is random fertilization
3. Gametes are pure for the trait
4. The zygotes are diploid

35 Consider the given two statements:

Assertion(A):	Law of segregation is also called as the law of purity of gametes.
Reason(R):	When the plant produces gametes, by the process of meiosis, the alleles of the gene separate or segregate from each other and only one allele is transmitted to a gamete.

1.	**(A)** is False but **(R)** is True
2.	**(A)** is True but **(R)** is False
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

36 What is the F_2 phenotypic ratio in cases of incomplete dominance?

1.	1 : 1	2.	3 : 1
3.	1 : 2 : 1	4.	1 : 1

37 The phenotypic and genotypic ratios are identical in:

I:	F_1 progeny of a monohybrid cross with complete dominance
II:	F2 progeny of a monohybrid cross with incomplete dominance

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

38 The inheritance of flower colour in dog flower and 4'O clock plant exhibits:

1.	Complete dominance	2.	Incomplete dominance
3.	Co-dominance	4.	Lethality

39 Consider the given two statements:

Assertion (A):	In incomplete dominance, segregation of unit factors does not take place.
Reason (R):	Incomplete dominance is blending inheritance.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

40 The F_2 genotypic and phenotypic ratio are identical in:

I.	Incomplete dominance
II.	Co-dominance

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

41 In the case of co-dominance, the F_1 generation resembles:

1.	Dominant parent	2.	Recessive parent
3.	Both the parents	4.	None of the parents

42 Blood group antigens are:

1.	Carbohydrates present in plasma
2.	Carbohydrates present on the surface of RBCs
3.	Plasma proteins
4.	Proteins present on the surface of RBCs

43 The inheritance of I^A and I^B allele exhibit:

1.	Complete dominance	2.	Incomplete dominance
3.	Co-dominance	4.	Lethality

44 The number of alleles, the genotypic combinations, and phenotypes in the ABO system are respectively:

1.	3, 6 and 4	2.	3, 4 and 6
3.	2, 3 and 4	4.	2, 3, and 6

45 What can the possible blood groups of progeny whose father and mother are of A and B blood groups, respectively?

1.	A and B only	2.	AB only
3.	All except O	4.	A, B, AB, and O

46 What can be the blood groups of progeny whose father and mother are of AB and O blood groups, respectively?

1.	A and B only	2.	AB only
3.	All except O	4.	A, B, AB, and O

47 Which type of inheritance pattern does the ABO blood group system follow?

A: Multiple alleles
B: Incomplete dominance
C: Co-dominance
D: Sex-linked inheritance

1. Only **A**
2. Only **A** and **B**
3. Only **A** and **C**
4. Only **B** and **C**

48 What would be the genotype of a mother with blood group 'A' and a father with blood group 'B' if their progeny has an 'O' blood group?

1.	Mother is homozygous for 'A' blood group and father is heterozygous for 'B'
2.	Mother is heterozygous for 'A' blood group and father is homozygous for 'B'
3.	Both the mother and father are heterozygous for 'A' and 'B' blood group, respectively
4.	Both the mother and father are homozygous for 'A' and 'B' blood group, respectively

49 The ultimate source of allelic variation is:

1.	Recombination	2.	Natural selection
3.	Mutation	4.	Drift

50 Theoretically, what can be the maximum number of alleles a particular gene can have?

1.	1	2.	2
3.	3	4.	Any number

51 Suppose a gene has seven alleles. What would be the number of alleles in an individual at any instant?

1.	1	2.	7
3.	2	4.	3

52 To study whether a gene exhibits multiple allelism or not, one must study:

1.	An individual	2.	A population
3.	A species	4.	With concentration!

53 Occasionally, a single gene product may produce more than one effect. Such a gene is said to be:

1.	Pleiotropic	2.	Polygenic
3.	Psuedoallele	4.	Housekeeping

54 In the case of starch synthesis in pea seeds [controlled by the B gene], BB homozygotes produce large and round starch grains; bb homozygotes produce smaller and wrinkled starch grains and heterozygotes produce round seeds of intermediate size. What can be inferred from this observation?

1.	The gene B mutates at a faster rate
2.	The gene B is easily influenced by the environment
3.	Dominance is not an autonomous feature of a gene or the product that it has information for.
4.	Some genes do not follow the law of segregation.

55 Consider the given two statements:

Assertion (A):	Pea plants that are heterozygous for the gene for starch synthesis produce seeds that are intermediate in size.
Reason (R):	If starch grain size is considered as the phenotype, then from this angle, the alleles show incomplete dominance.

1.	**(A)** is False but **(R)** is True
2.	**(A)** is True but **(R)** is False
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

56 Consider the given two statements:

Assertion (A):	Dominance is not an autonomous feature of a gene or the product that it has information for.
Reason (R):	Not all genes code for proteins.

1.	**(A)** is True but **(R)** is False
2.	**(A)** is False but **(R)** is True
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

INHERITANCE OF TWO GENES

57 When Mendel self-hybridized F_1 progeny of a dihybrid cross between pure Yellow Round seeded plants and Green Wrinkled plants, he observed that yellow and green colour segregated in a ratio of:

1.	1 : 1	2.	3 : 1
3.	9 : 3 : 3 : 1	4.	1 : 2 : 1

58 Using the genotypic symbols Y for dominant yellow seed colour and y for recessive green seed colour, R for round shaped seeds and r for wrinkled seed shape, when a plant with genotype RrYy is self-hybridized, the proportion of progeny with yellow seeds is expected to be:

1. 9/16
2. 3/16
3. 3/4
4. 1/4

59 Monohybrid cross can explain:

I:	Law of dominance
II:	Law of segregation
III:	Law of independent assortment

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

60 'When two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters'. This is the statement of:

1. Law of Dominance
2. Law of segregation
3. Law of Independent Assortment
4. Law of Linkage

61 Assuming independent assortment, the percent of progeny with genotype AABb from a cross AaBb X AaBb is expected to be:

1.	7.5	2.	15
3.	12.5	4.	30

62 Regarding the law of independent assortment:

Statement I:	Because of independent assortment and dominance, the 9:3:3:1 dihybrid phenotypic ratio can be collapsed into two 3:1 ratios, characteristic of any monohybrid cross that follows a dominant and recessive pattern.
Statement II:	The law of independent assortment also indicates that a cross between yellow, wrinkled (YYrr) and green, round (yyRR) parents would yield the same F_1 and F_2 offspring as in the YYRR x yyrr cross.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

63 In a typical dihybrid cross $AaBb \times AaBb$ [symbols have usual meanings; assume independent assortment], what proportion of progeny are expected to carry both dominant alleles?

1. ¼
2. 9/16
3. 3/16
4. ½

64 What would be the number of types of gametes produced by a plant with genotype $AaBbCc$ [assume independent assortment between all loci]?

1. 6
2. 8
3. 9
4. 16

65 The physical basis of independent assortment is:

1. Metaphase I of Meiosis I
2. Metaphase II of Meiosis II
3. Anaphase I of Meiosis I
4. Anaphase II of Meiosis II

66 Match the following terms with their descriptions based on Mendel's experiments:

	Column I		Column II
A.	Law of Segregation	P.	States that alleles segregate randomly during gamete formation
B.	Law of Independent Assortment	Q.	Crossing involving individuals differing in only one trait
C.	Monohybrid Cross	R.	Crossing involving individuals differing in two traits
D.	Dihybrid Cross	S.	States that alleles of different genes assort independently during gamete formation

Codes:

	A	B	C	D
1.	P	Q	R	S
2.	Q	P	R	S
3.	P	S	Q	R
4.	Q	P	S	R

67 What is the dihybrid test cross-ratio?

1.	1 : 1	2.	3 : 1
3.	9 : 3 : 3 : 1	4.	1 : 1 : 1: 1

68 A typical dihybrid cross results in the formation of 500 F_2 progeny. What is the expected number of recombinants among these progeny?

1. 280
2. 31
3. 94
4. 187

69 What is the number of phenotypes and genotypes in the F_2 generation of a Mendelian dihybrid cross?

1. phenotypes - 4; genotypes - 16
2. phenotypes - 9; genotypes - 4
3. phenotypes - 4; genotypes - 8
4. phenotypes - 4; genotypes - 9

70 That the pairing and separation of a pair of chromosomes would lead to the segregation of a pair of factors they carried is the argument that formed the basis for:

1. the Law of Independent Assortment.
2. the concept of Linkage
3. the chromosomal theory of inheritance.
4. the One Gene One Enzyme hypothesis.

71 The chromosomal theory of inheritance:

I: identifies chromosomes as the carriers of genetic material.
II: was given by Sutton and Boveri.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 In 1900, Mendel's work was rediscovered by:

1. Khorana, Nirenberg and Mathei
2. de Vries, Correns and von Tschermak
3. Avery, McCleod and McCarty
4. Watson, Crick and Wilkins

73 Mendel's work remained unrecognised till 1900. Which of the following was not a reason for this?

1. His work was widely publicised and it brought a bad name to Mendel.
2. His concept of factors as stable and discrete units that did not 'blend' was not accepted.
3. His approach of using mathematics to explain biological phenomena was unacceptable.
4. He could not provide any physical proof for the existence of factors or say what they were made of.

74 The two alleles of a gene pair are located on:

1. The same chromosome.
2. Different chromosomes.
3. Homologous sites on homologous chromosomes.
4. Homologous sites on heterologous chromosomes.

75 "Chromosomes, which are seen in all dividing cells and pass from one generation to the next, are the basis for all genetic inheritance".
This statement is credited to:

1. Watson and Crick
2. Hershey and Chase
3. Sutton and Boveri
4. Meselson and Stahl

76 Consider the given two statements:

Assertion (A):	The physical basis for segregation is the splitting of centromere during anaphase I of meiosis I.
Reason (R):	At anaphase I, the sister chromatids separate and move towards opposite poles.

1. Both **(A)** and **(R)** are False
2. **(A)** is True but **(R)** is False
3. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

77 T. H. Morgan worked on the fruit fly, *Drosophila melanogaster*. Which of the following is not an advantage of this fly?

1. They could be grown on a simple synthetic medium in the laboratory.
2. They complete their life cycle in about two years, and a single mating could produce a large number of progeny flies.
3. There was a clear differentiation of the sexes – the male and female flies are easily distinguishable.
4. It has many types of hereditary variations that can be seen with low-power microscopes.

78 When Morgan hybridised yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their F_1 progeny, the F_2 ratio deviated very significantly from the 9:3:3:1 ratio. This can be attributed to the fact that:

1. The genes are located on the X and Y chromosomes.
2. Fruit fly has abnormal chromosomes.
3. The genes are located on the X chromosome.
4. The genes exhibit incomplete dominance.

79 When the two genes in a dihybrid cross are situated on the same chromosome:

1.	The proportion of parental gene combinations was much higher than the non-parental type.
2.	The proportion of parental gene combinations was much lesser than the non-parental type.
3.	The proportion of parental gene combinations was equal to the non-parental type.
4.	Only recombinants are formed.

80 Morgan coined the term ______ to describe this physical association of genes on a chromosome and the term _________ to describe the generation of non-parental gene combinations.

1.	Recombination; Linkage	2.	Linkage, Mutation
3.	Transposition, Mutation	4.	Linkage, Recombination

81 Genes tightly linked on the same chromosome show:

1.	Very high recombination	2.	Independent assortment
3.	Very low recombination	4.	50 % recombination

82 A dihybrid test cross results in a recombination frequency of 50%. Most likely the two genes under consideration:

1.	are closely linked on the same autosome
2.	are located on heterologous chromosomes
3.	are present on the X chromosome
4.	are located on the same chromosome, one on either side of the centromere

83 The progeny of a dihybrid test cross AaBb x aabb show the following genotypes: AaBb 160, Aabb 460, aaBb 440, aabb 140. The recombination frequency between the two loci is:

1.	12.5 %		25 %
3.	15 %	4.	30 %

84 An individual with c and d genes was crossed with the wild type ++. On test crossing F_1, the progeny were +c 105, +d 115, cd 880 and ++900. Distance between c and d genes is:

1.	11 map units	2.	5.5 map units
3.	44 map units	4.	22 map units

85 Consider three genes: X, Y, and Z. The recombination frequency between X-Y, X-Z, and Y-Z gene pairs was found to be 50%, 25%, and 50%, respectively. What would be the right inference?

1.	genes X and Y are on the same chromosome
2.	genes X and Z are on different chromosomes
3.	genes Y and Z are on different chromosomes
4.	All three genes are located on the same chromosome

86 In a fruit fly, the eye colour trait is located on X-chromosome and the vestigial wing trait is located on an autosome. What is the possibility that a cross between a white-eyed male fruit fly with vestigial wings and a wild-type female who is heterozygous for both traits will result in a female offspring with vestigial wings and white eyes?

1.	1/16	2.	1/8
3.	¼	4.	½

87 The number of linkage groups in a plant with a normal diploid number of chromosomes in a somatic cell as 16 will be:

1. 16
2. 8
3. 4
4. It is impossible to tell from the information provided.

88 Consider the given two statements:

Assertion(A):	When the two genes in a dihybrid cross were situated on the same chromosome, the proportion of parental gene combinations were much higher than the non-parental type.
Reason(R):	The strength of linkage between genes located on the same chromosome is directly proportional to the distance between them.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

89 Consider the given two statements:

Assertion(A):	Behaviour of chromosomes at the time of cell division decides the behaviour of genes.
Reason(R):	Chromosomes are the vehicles of the genes.

1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

90 Consider the given two statements:

Assertion(A):	Morgan found the use of Drosophila melanogaster as very convenient for his studies.
Reason(R):	Morgan was studying mutations and Drosophila melanogaster is haploid and expresses all mutations.

1.	**(A)** is True but **(R)** is False
2.	**(A)** is False but **(R)** is True
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

91 If the strength of linkage between y and w is higher than w and m [y, w and m are three linked genes located on a chromosome]:

1.	the number of recombinants between y and w will be higher than the number of recombinants between w and m.
2.	the number of recombinants between y and w will be lower than the number of recombinants between w and m.
3.	the number of recombinants between y and w will be equal to the number of recombinants between w and m.
4.	no recombinants between y and w and between w and m will be formed as they are linked.

92 If mapping of genes is carried out based on linkage analysis, it:

1.	helps in identifying the physical location of genes on a chromosome
2.	determines the size of chromosomes
3.	predicts the number of chromosomes in an organism
4.	reveals the function of genes in an organism

93 When preparing genetic map using recombination data, it is assumed that 1% of crossing over equals:

1. one map unit.
2. two map units.
3. five two map units.
4. ten map units.

POLYGENIC INHERITANCE

94 A trait displays continuous phenotypic variation and is spread across a gradient. Usually, the inheritance of this trait can be described as:

1. dominant-recessive inheritance
2. multiple-allele inheritance
3. polygenic inheritance
4. sex-linked inheritance

95 An F_2 phenotypic ratio of 1: 4: 6: 4: 1 from a cross AaBb X AaBb is expected in the case of:

1.	Dominant epistasis	2.	Complementary genes
3.	Polygenic inheritance	4.	Independent assortment

96 Human skin colour is a polygenic trait controlled by:

1.	2 genes	2.	3 genes
3.	4 genes	4.	6 genes

97 Identify the number of correct statements:

I:	Polygenic inheritance takes into account the influence of the environment.
II:	In a polygenic trait, the phenotype reflects the contribution of each allele, i.e., the effect of each allele is additive.
III:	The normal distribution curve is bell-shaped in polygenic inheritance.
IV:	It is also known as quantitative inheritance.

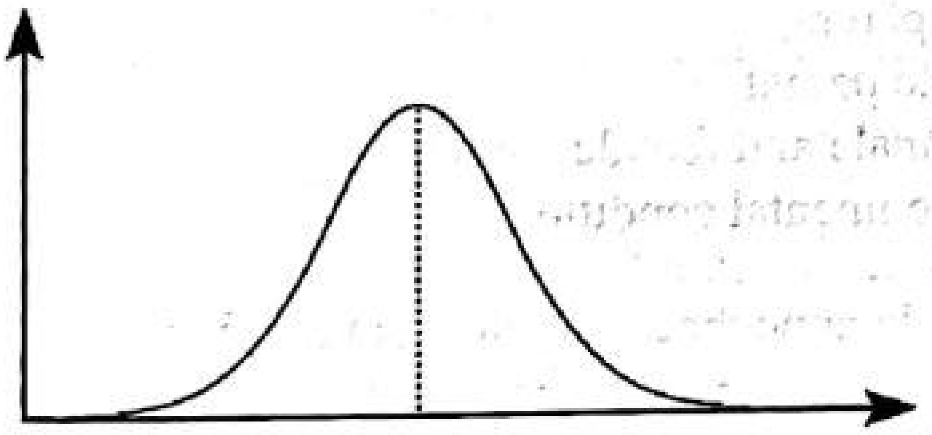
1.	0	2.	1
3.	3	4.	4

98 Consider the given two statements:

Assertion(A):	In humans, an individual with genotype AABBCc will be similar in complexion to an individual with genotype AABBcc.
Reason(R):	The effect of each allele is additive in polygenic inheritance.

1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

99 The type of distribution curve shown in the figure is seen in:



1. Co-dominance
2. Multiple allelism
3. Polygenic inheritance
4. Pleiotropy

100 A male with genotype *AABBCC* and a very dark complexion mates with a female with genotype *aabbcc* and a very fair complexion. What is the probability of their progeny being born with an intermediate skin colour type?

1.	6/64	2.	15/64
3.	20/64	4.	1/64

PLEIOTROPY

101 Consider the given two statements:

Assertion (A):	The underlying mechanism of pleiotropy in most cases is the effect of a gene on metabolic pathways which contribute towards different phenotypes.
Reason (R):	Pleiotropy occurs when one gene influences two or more seemingly unrelated phenotypic traits.

1.	**(A)** is False but **(R)** is True
2.	**(A)** is True but **(R)** is False
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

102 Pleiotropy, a deviation from Mendel, refers to:

1.	Multiple genes influencing a single trait.
2.	One gene having multiple effects on different traits.
3.	A gene's effects being masked by another gene.
4.	The inheritance of traits controlled by multiple alleles.

SEX DETERMINATION

103 During his observation of spermatogenesis in a few insects, Henking found that a nuclear structure was received by 50 % of the sperms. He called this structure as:

1.	X – body	2.	Y–body
3.	X – chromosome	4.	Y – chromosome

104 In grasshoppers, what is the chromosomal composition of a male individual?

1.	XX	2.	XY
3.	XO	4.	Both XX and XY

105 The mechanism of sex determination in grasshoppers is:

1.	XX – XY; male heterogamety
2.	XX – XY; female heterogamety
3.	XX – XO; male heterogamety
4.	XX – XO; female heterogamety

106 In humans, the mechanism of sex determination is:

1.	XX – XY; male heterogamety
2.	XX – XY; female heterogamety
3.	XX – XO; male heterogamety
4.	XX – XO; female heterogamety

107 In birds, the mechanism of sex determination is:

1.	XX – XY; male heterogamety
2.	ZZ – ZW; female heterogamety
3.	XX – XO; male heterogamety
4.	ZZ – ZW; male heterogamety

108 A couple has a daughter. What is the probability that their next child will be a daughter?

1.	0 %	2.	25 %
3.	50 %	4.	100 %

109 Consider the given two statements:

Assertion (A):	Male honeybees do not have father and thus cannot have sons, but have a grandfather and can have grandsons.
Reason (R):	Male honeybees produce sperms by mitosis.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

110 Identify the incorrectly matched pair:

	Organism	Mechanism of sex determination
1.	Honey bees	Haplo-diploidy
2.	Grasshoppers	XX-XO female heterogamety
3.	Birds	ZZ-ZW female heterogamety
4.	Fruit fly	Genic balance

111 ZZ / ZW, female heterogamety, type of sex determination is seen in:

1. Platypus
2. Snails
3. Cockroach
4. Fowl

112 Consider the given two statements:

Assertion (A):	It is unfortunate that in our society women are blamed for giving birth to female children and have been ostracised and ill-treated because of this false notion.
Reason (R):	In each pregnancy, there is always 50 percent probability of either a male or a female child.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

113 In fowl, the sex of offspring is determined by:

1. Male parent
2. Female parent
3. Both male and female parents
4. Environmental conditions

114 Male honeybees produce gametes by:

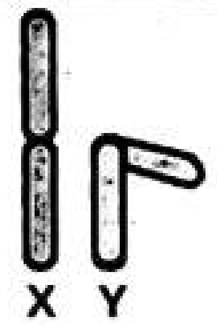
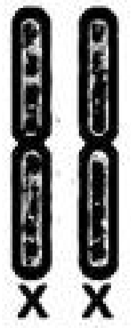
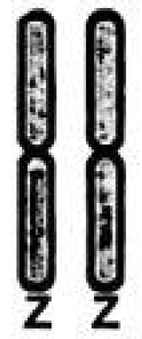
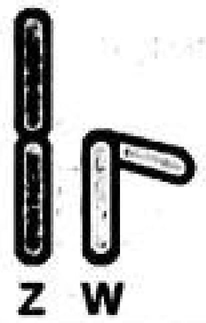
1.	Mitosis
2.	Meiosis
3.	Abnormal mitosis
4.	Male honeybees are sterile; they do not produce gametes

115 Match the following organisms with their sex determination mechanism:

	Column I		Column II
A	Humans	1	XO-XX
B	Drosophila	2	ZW-ZZ
C	Birds	3	XY-XX
D	Grasshopper	4	Genic balance

1. A-3, B-1, C-2, D-4
2. A-3, B-4, C-2, D-1
3. A-2, B-4, C-1, D-3
4. A-4, B-2, C-3, D-1

116 Which of the following describes a male in birds?

1.		2.	
3.		4.	

MUTATION

117 Mutations that arise due to changes in a single base pair of DNA are called as:

1.	Chromosomal aberrations	2.	Point mutations
3.	Nonsense mutations	4.	Frameshift mutations

118 Consider the given two statements:

Assertion (A):	UV radiations can cause mutations in organisms – it is a mutagen.
Reason (R):	UV radiations are ionising radiations.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
4.	**(A)** is False but **(R)** is True

GENETIC DISORDERS

119 Pedigree analysis is used for genetic analysis in humans rather than conventional genetic methods because:

I:	Choice matings are not possible.
II:	The number of progeny is limited.

Of the two statements:

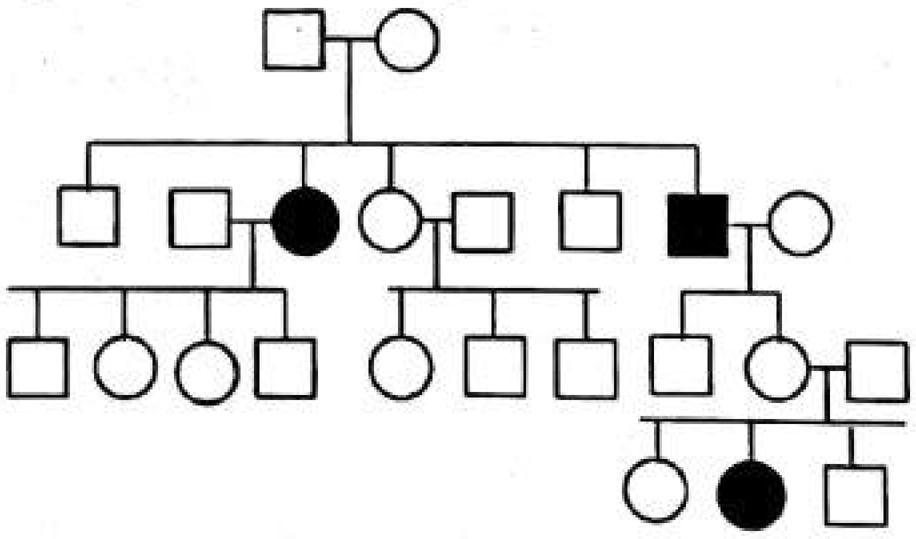
1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

120 Consider the given two statements:

Assertion(A):	The pattern of inheritance of Mendelian disorders can be traced in a family by the pedigree analysis.
Reason(R):	Mendelian disorders are mainly determined by alteration or mutation in a single gene with complete dominance.

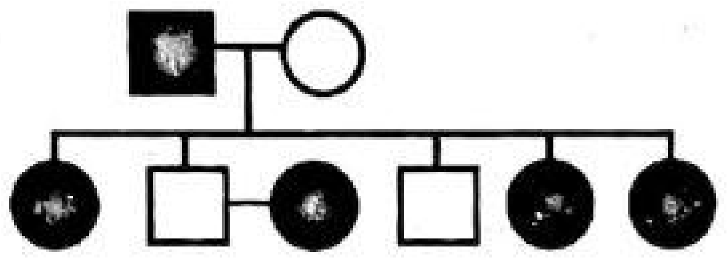
1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

121 This type of inheritance pattern for the trait shown in the given pedigree most likely is:



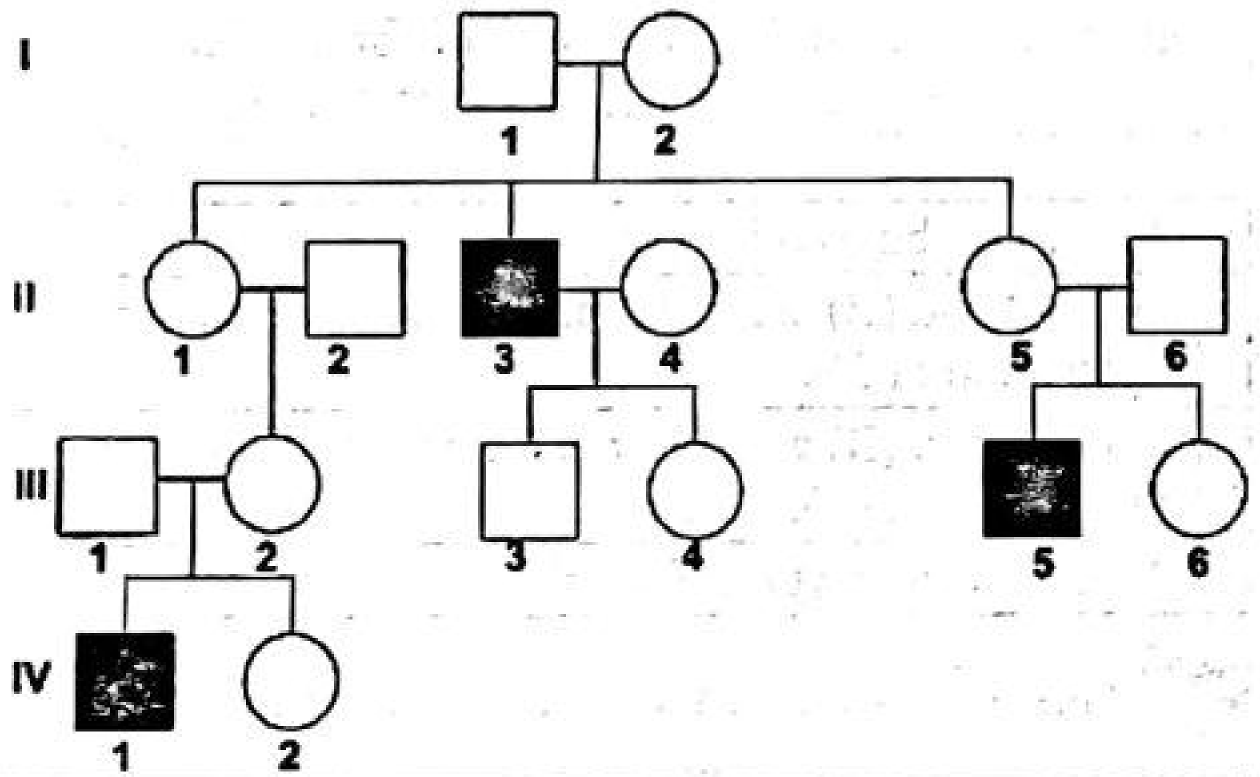
1. Autosomal Dominant
2. Autosomal Recessive
3. X-linked Dominant
4. X linked recessive

122 The pedigree shown below, most likely, exhibits the inheritance of a/an:



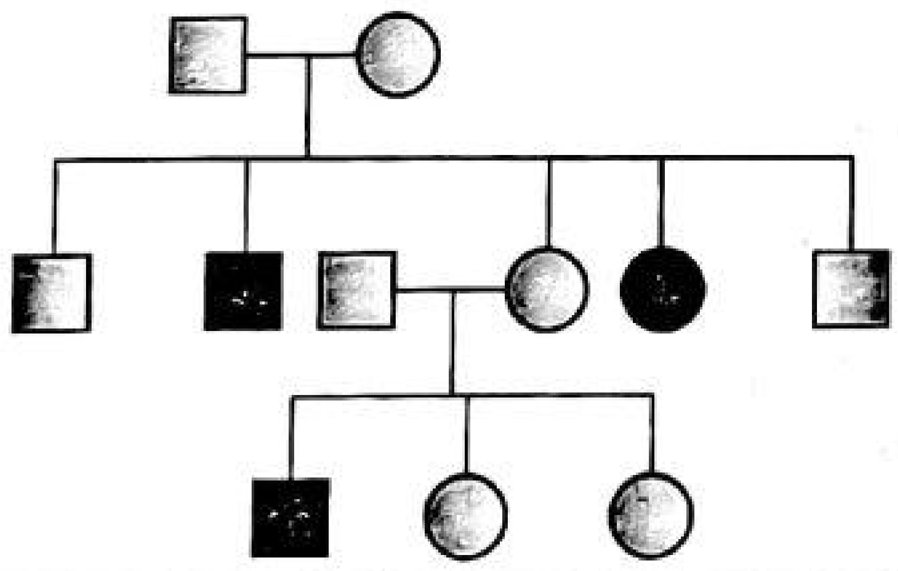
1. Autosomal recessive trait
2. Autosomal dominant trait
3. X linked recessive trait
4. X linked dominant trait

123 The most likely mode of inheritance of the trait shown in the pedigree given below will be [give the most appropriate answer]:



1.	Autosomal recessive	2.	Autosomal dominant
3.	Sex linked recessive	4.	Sex linked dominant

124 The disease inheritance pattern exemplified in the given pedigree analysis can be:



1.	Hemophilia	2.	Red-green colour blindness
3.	Phenyl ketonuria	4.	Polydactyly

125 Consider the two statements:

Statement I:	Marriages between close relations [consanguineous marriages] should be avoided.
Statement II:	Such marriages lead to an increased birth prevalence of infants with severe recessive disorders.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

126 Mendelian disorders are mainly determined by:

1.	Alteration or mutation in a single gene.
2.	Chromosomal gross structural changes.
3.	Recombination between linked genes.
4.	Jumping genes

127 Which of the following is not an X – linked recessive disorder in humans?

1.	Red-green colour blindness
2.	Haemophilia
3.	Duchenne muscular dystrophy
4.	Vitamin D-resistant rickets

128 A human female who is not color blind but whose father was color blind marries a normal male. What proportion of their male progeny will have red-green color blindness?

1.	75%	2.	50%
3.	25%	4.	0%

129 The source of any of the genes located on either of the X chromosomes in a female cannot be:

1.	Her Mother's Father.	2.	Her Father's Mother.
3.	Her Mother's Mother.	4.	Her Father's Father.

130 What is incorrect for Hemophilia?

1.	In this disease, a single protein that is a part of the cascade of proteins involved in the clotting of blood is affected.
2.	In an affected individual, a simple cut will result in non-stop bleeding.
3.	The heterozygous female (carrier) for haemophilia may transmit the disease to her sons.
4.	The possibility of a female becoming haemophilic is extremely rare because the mother of such a female has to be hemophilic and the father should be a carrier.

131 Consider the given two statements:

Assertion (A):	Sex linked recessive traits are more common in females than in males of the species.
Reason (R):	Since females have two X chromosomes, the chances of their getting affected by a recessive X linked gene are higher.

1.	**(A)** is False but **(R)** is True
2.	Both **(A)** and **(R)** are False
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

132 If a mother is a carrier for an X-linked recessive disease and the father is unaffected, what is the probability of their child being affected?

1.	25%, if the child is male; 25%, if the child is female
2.	50%, if the child is male; 0%, if the child is female
3.	50%, if the child is male; 25%, if the child is female
4.	25%, if the child is male; 0%, if the child is female

133 Consider the given two statements:

Assertion(A):	The possibility of a female becoming a haemophilic is extremely rare.
Reason(R):	In haemophilia, a single protein that is a part of the cascade of proteins involved in the clotting of blood is affected.

1.	**(A)** is True but **(R)** is False
2.	**(A)** is False but **(R)** is True
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

134 How many of the given genetic disorders are inherited as a recessive condition?

I: Sickle cell anaemia
II: Colour blindness
III: Phenylketonuria
IV: Haemophilia

1. 1
2. 2
3. 3
4. 4

135 The family pedigree of Queen Victoria shows a number of haemophilic descendants as she was:

1.	Affected by the disease
2.	Carrier for the disease
3.	Did not carry the allele for hemophilia
4.	Was not a queen

136 Identify the incorrect statement:

1.	In addition to recombination, the mutation is another phenomenon that leads to variation in DNA.
2.	Chromosomal aberrations are commonly observed in cancer cells.
3.	A classical example of a point mutation is sickle cell anemia.
4.	Non-ionising radiations cannot be mutagens.

137 Sickle cell anaemia results from:

1. A chromosomal aberration
2. Non-disjunction of autosome
3. A point mutation
4. Blood transfusion reaction

138 The point mutation in sickle cell anaemia leads to a change in the codon. Identify the correct change:

1.	UGA to UAA	2.	GUG to GAG
3.	GAG to GUG	4.	UAA to UGA

139 Which of the following amino acid substitution in the beta chain of the haemoglobin molecule leads to the development of sickle cell anaemia?

1. Arginine by tyrosine
2. Tyrosine by phenylalanine
3. Valine by Glutamic acid
4. Glutamic acid by Valine

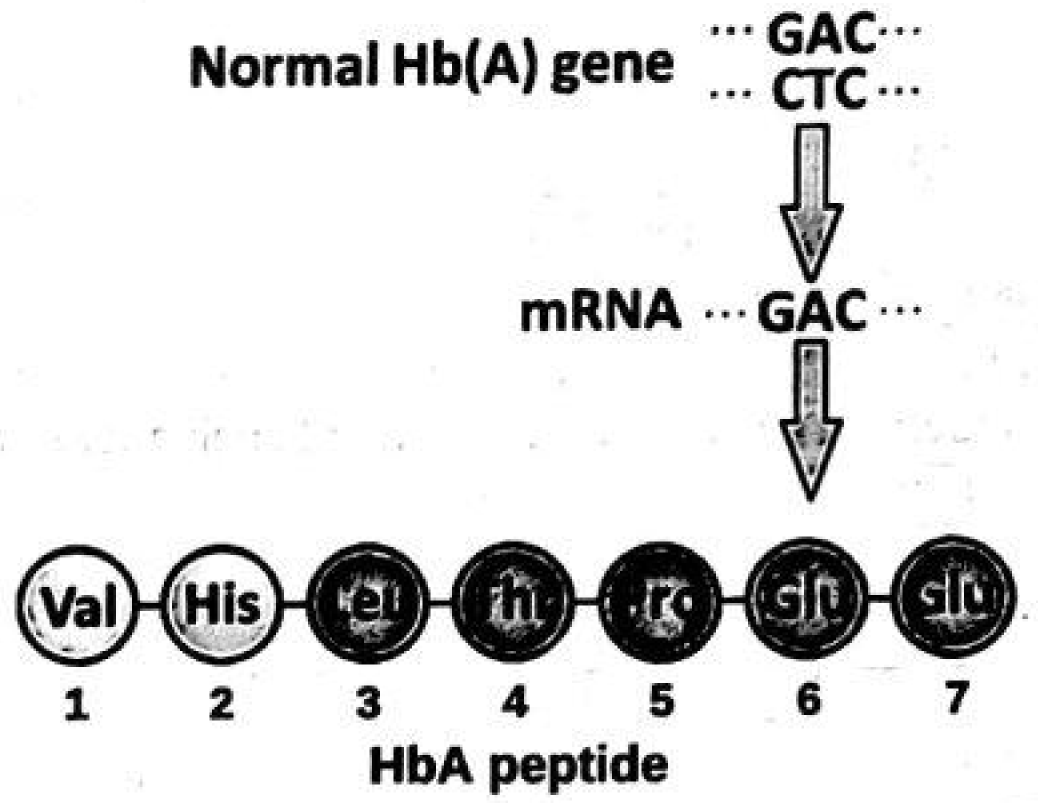
140 In sickle cell anaemia, the mutant haemoglobin molecule undergoes:

1.	Polymerisation under low oxygen tension causing changes in the shape of the RBC to a sickle-like structure
2.	Depolymerisation under low oxygen tension causing that changes the shape of the RBC to a sickle-like structure
3.	Denaturation under high oxygen tension causing changes in the shape of the RBC to a sickle-like structure
4.	Denaturation

141 The sickle cell trait provides a survival advantage against:

1. Malaria
2. HIV
3. Covid 19
4. Swine flu

142 Given below is the initial amino acids of the beta chain of a haemoglobin molecule. What will be true about this haemoglobin molecule?



1.	The RBCs carrying this molecule will undergo sickling at a high oxygen tension
2.	The RBCs carrying this molecule will undergo sickling at a low oxygen tension
3.	There will be a quantitative decrease in the synthesis of this molecule
4.	This is the normal beta chain of the haemoglobin molecule

143 Given below [A – E] are suggested causes for the genetic diseases. Select the cause as your answer for the given disease.

A.	A single nucleotide mutation results in a polar amino acid being substituted by a non-polar amino acid in the polypeptide.
B.	Autosomal recessive inborn error of metabolism where mutation renders a key enzyme involved in amino acid metabolism non-functional.
C.	X-linked recessive condition is more common in males than in females.
D.	Caused by a primary autosomal non-disjunction event.
E.	Caused by a non-disjunction event in sex chromosomes in either of the sexes.

Sickle cell anaemia:

1.	A	2.	B
3.	C	4.	D

144 What is the mode of inheritance of phenylketonuria?

1.	Autosomal recessive	2.	Autosomal dominant
3.	Sex linked recessive	4.	Sex linked dominant

145 In cases of Phenylketonuria:

1.	The affected individual lacks an enzyme that converts the amino acid tyrosine into phenylalanine.
2.	The affected individual makes an enzyme that converts the amino acid tyrosine into phenylalanine.
3.	The affected individual makes an enzyme that converts the amino acid phenylalanine into tyrosine.
4.	The affected individual lacks an enzyme that converts the amino acid phenylalanine into tyrosine.

146 Consider the given two statements:

Assertion(A):	Patients of phenylketonuria can show mental retardation.
Reason(R):	Phenylpyruvic acid can get accumulated in the brain of the patients suffering from phenylketonuria.

1.	**(A)** is True but **(R)** is False
2.	**(A)** is False but **(R)** is True
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

147 Consider the given two statements:

Assertion(A):	A simple treatment for children suffering from phenylketonuria can be diet restrictions.
Reason(R):	Phenylalanine is an essential amino acid.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

148 A man and a woman carry an allele for Phenylketonuria. Their first progeny, a boy, is affected by the disorder. What is the probability that their second progeny might also be affected by the disorder?

1. None, if the second child is a female
2. None, if the second child is a male
3. 2/3
4. 1/4

149 Consider the following two statements:

Statement I:	Phenylketonuria is an autosomal recessive disorder
Statement II:	Phenylketonuria is an inborn error of metabolism

1. Only **Statement I** is correct
2. Only **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

150 Thalassemia is inherited as a/an ____________ condition.

1.	Autosomal recessive	2.	Autosomal dominant
3.	Sex linked recessive	4.	Sex linked dominant

151 What will be true regarding the comparison of thalassemia and sickle cell anaemia?

1.	The former is a quantitative problem of synthesising too few globin molecules while the latter is a qualitative problem of synthesising an incorrectly functioning globin.
2.	The former is a qualitative problem of synthesising too few globin molecules while the latter is a quantitative problem of synthesising an incorrectly functioning globin.
3.	Both disorders are qualitative problems of synthesising too few globin molecules.
4.	Both disorders are quantitative problems of synthesising too few globin molecules.

152 Consider the given two statements:

Assertion (A):	Both α- and β-thalassemias are often inherited in an autosomal recessive manner.
Reason (R):	The thalassemias are classified according to which chain of the hemoglobin molecule is affected.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

153 The β-globin chains of hemoglobin are encoded by:

1.	a single gene on chromosome 11
2.	two closely linked genes on chromosome 16
3.	a single gene on chromosome 16
4.	two closely linked genes on chromosome 11

154 When there is a change in the chromosome number such that the changes number is not an exact multiple of base number [haploid number], the condition is called as:

1.	Euploidy	2.	Aneuploidy
3.	Aberration	4.	Non-disjunction

155 Failure of cytokinesis after telophase stage of cell division results in an increase in a whole set of chromosomes in an organism and this phenomenon is known as:

1.	Aneuploidy	2.	Translocation
3.	Polyploidy	4.	Inversion

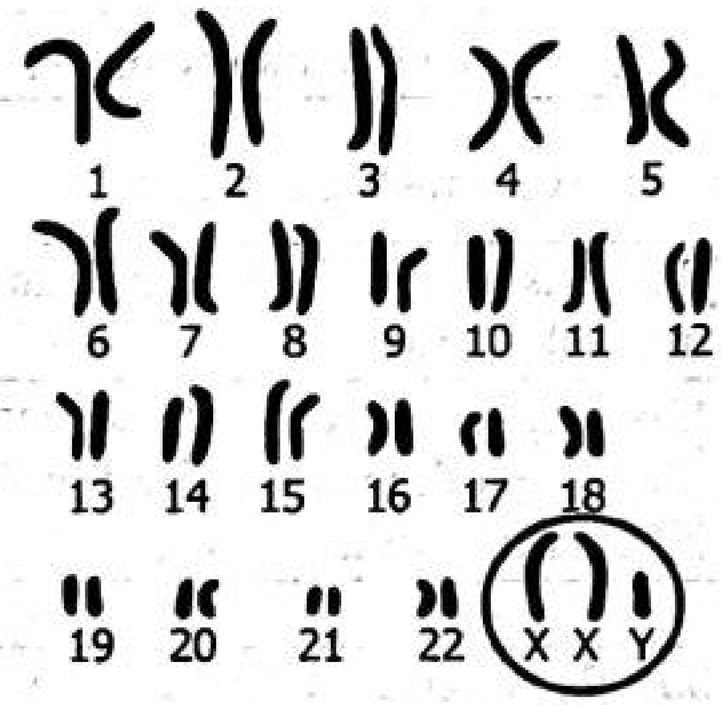
156 A changed chromosome number such as 2n +1, 2n – 1 and 2n + 2, 2n – 2 is called:

1. Aneuploidy
2. Polyploidy
3. Allopolyploidy
4. Monosomy

157 Which of the following is not a feature of Down's Syndrome?

1.	It is caused by a non-disjunction in an autosome.
2.	The affected individual has a trisomy of chromosome 21.
3.	The affected individual has a characteristic simian palmar crease.
4.	The mental development of the affected individual is normal.

158 The karyotype shown below is of a person affected with:



1. Klinefelter's syndrome
2. Turner's syndrome
3. Down's syndrome
4. Edward's syndrome

159 Down's syndrome:

I:	is an aneuploidy
II:	is trisomy 21
III:	always runs in a family
IV:	does not affect the life span and fertility

1. Only **I** and **II** are correct
2. Only **III** and **IV** are correct
3. Only **I** and **III** are correct
4. Only **II** and **IV** are correct

160 An autosomal primary non-disjunction event is the causal factor for:

1. Down's syndrome
2. Klinefelter's syndrome
3. Turner's syndrome
4. Conn's syndrome

161 An individual affected by Klinefelter's syndrome:

1.	Has 47 autosomes.
2.	Has overall feminine development.
3.	Has gynecomastia.
4.	Has an additional copy of the Y chromosome.

162 Consider the given two statements:

Assertion(A):	Gynecomastia is expressed commonly in Klinefelter's syndrome.
Reason(R):	The genetic sex of individuals affected by Klinefelter's syndrome is female.

1.	**(A)** is True but **(R)** is False
2.	**(A)** is False but **(R)** is True
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

163 Which of the following will not be true regarding Klinefelter's syndrome?

1. The affected individual is generally fertile.
2. Gynecomastia is frequently seen.
3. The karyotype is 47 - XXY.
4. It is an aneuploidy.

164

Assertion (A):	The genetic sex of an individual with Klinefelter's syndrome is female
Reason (R):	Only X-chromosome is present in their genotype

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of the **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of the **(A)**
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

165 An individual affected with Turner's Syndrome:

I:	Is a female
II:	Has 45 chromosomes
III:	Has rudimentary ovaries

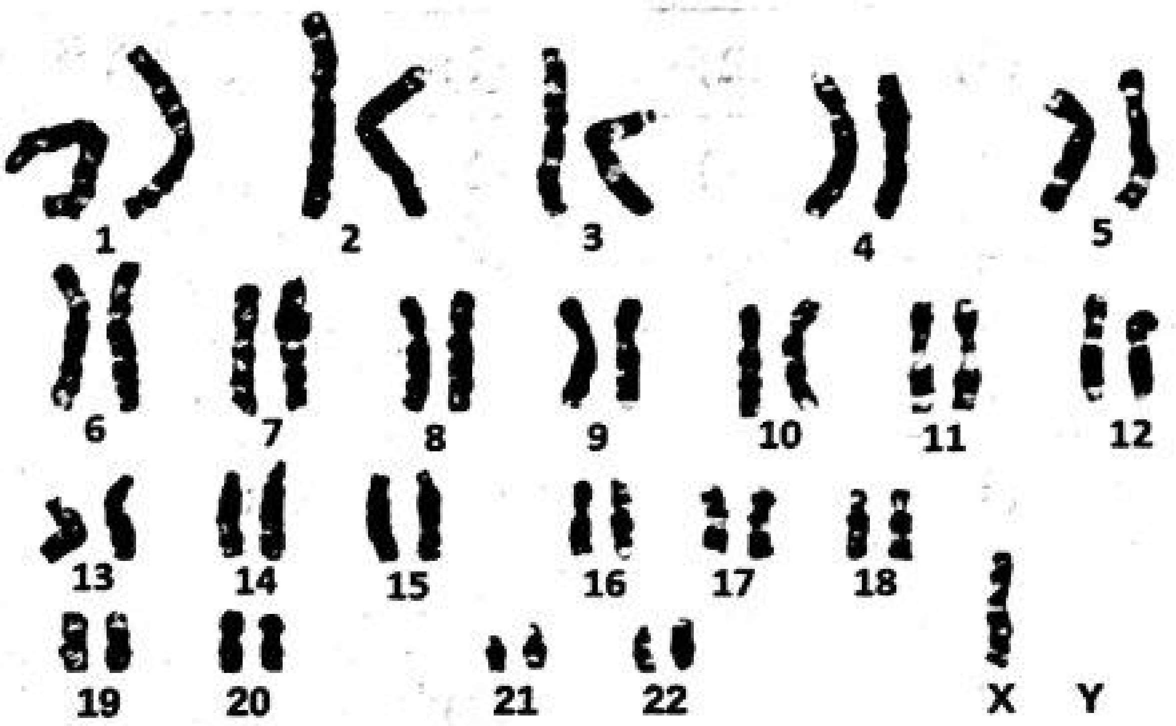
Of the above statements, the correct statements are:

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

166 Turner's syndrome is caused by:

1. Non-disjunction of autosomes.
2. Non-disjunction of sex chromosomes.
3. Deletion of part of a sex chromosome.
4. Translocation of chromosome parts.

167 Study the given diagram and select the correct option:



1.	The karyotype is of an individual suffering from Down's syndrome
2.	The number of autosomes seen is 43
3.	The genetic sex of this individual must be female
4.	The fertility will be maintained in this individual

PRINCIPLES OF INHERITANCE AND VARIATION - ANSWER KEY

1.	(1)	2.	(2)	3.	(3)	4.	(2)	5.	(3)	6.	(3)	7.	(4)	8.	(2)	9.	(1)	10.	(4)
11.	(4)	12.	(3)	13.	(3)	14.	(1)	15.	(4)	16.	(2)	17.	(1)	18.	(3)	19.	(2)	20.	(1)
21.	(2)	22.	(3)	23.	(2)	24.	(1)	25.	(3)	26.	(4)	27.	(2)	28.	(3)	29.	(4)	30.	(2)
31.	(4)	32.	(1)	33.	(1)	34.	(1)	35.	(3)	36.	(3)	37.	(3)	38.	(2)	39.	(4)	40.	(3)
41.	(3)	42.	(2)	43.	(3)	44.	(1)	45.	(4)	46.	(1)	47.	(3)	48.	(3)	49.	(3)	50.	(4)
51.	(3)	52.	(2)	53.	(1)	54.	(3)	55.	(3)	56.	(4)	57.	(2)	58.	(3)	59.	(1)	60.	(3)
61.	(3)	62.	(1)	63.	(2)	64.	(2)	65.	(1)	66.	(3)	67.	(4)	68.	(4)	69.	(4)	70.	(3)
71.	(3)	72.	(2)	73.	(1)	74.	(3)	75.	(3)	76.	(1)	77.	(2)	78.	(3)	79.	(1)	80.	(4)
81.	(3)	82.	(2)	83.	(2)	84.	(1)	85.	(3)	86.	(2)	87.	(2)	88.	(3)	89.	(2)	90.	(1)
91.	(2)	92.	(1)	93.	(1)	94.	(3)	95.	(3)	96.	(2)	97.	(4)	98.	(1)	99.	(3)	100.	(3)
101.	(4)	102.	(2)	103.	(1)	104.	(3)	105.	(3)	106.	(1)	107.	(2)	108.	(3)	109.	(2)	110.	(2)
111.	(4)	112.	(2)	113.	(2)	114.	(1)	115.	(2)	116.	(3)	117.	(2)	118.	(1)	119.	(3)	120.	(2)
121.	(2)	122.	(4)	123.	(3)	124.	(3)	125.	(1)	126.	(1)	127.	(4)	128.	(2)	129.	(4)	130.	(4)
131.	(2)	132.	(2)	133.	(4)	134.	(4)	135.	(2)	136.	(4)	137.	(3)	138.	(3)	139.	(4)	140.	(1)
141.	(1)	142.	(4)	143.	(1)	144.	(1)	145.	(4)	146.	(3)	147.	(1)	148.	(4)	149.	(3)	150.	(1)
151.	(1)	152.	(2)	153.	(1)	154.	(2)	155.	(3)	156.	(1)	157.	(4)	158.	(1)	159.	(1)	160.	(1)
161.	(3)	162.	(1)	163.	(1)	164.	(4)	165.	(4)	166.	(2)	167.	(3)						

MOLECULAR BASIS OF INHERITANCE

INTRODUCTION

1 Consider the given statements:

I:	DNA – deoxyribonucleic acid – is the genetic material, at least for the majority of organisms.
II:	RNA though it also acts as a genetic material in some viruses, mostly functions as a messenger.
III.	RNA can function as an adapter, structural, and in some cases as a catalytic molecule.

1.	Only **I** and **II** are correct	2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct	4.	**I, II,** and **III** are correct

THE DNA

2 Nucleic acids are polymers of:

1.	Nucleosides	2.	Nucleotides
3.	Amino acids	4.	Polypeptides

3 Identify the incorrectly matched pair:

	Organism	Length of DNA
1.	Bacteriophage ϕ 174	5386 base pairs
2.	Bacteriophage Lambda	48502 base pairs
3.	*Escherichia coli*	4×10^6 base pairs
4.	Human beings	3.3×10^9 base pairs

4 To form a nucleoside, a nitrogenous base is linked to a pentose sugar:

1.	Through a P-Glycosidic linkage at carbon atom number 1
2.	Through a P-Glycosidic linkage at carbon atom number 5
3.	Through an N-Glycosidic linkage at carbon atom number 1
4.	Through an N-Glycosidic linkage at carbon atom number 5

5 Which of the following is a pyrimidine base found in DNA?

1.	Adenine	2.	Guanine
3.	Uracil	4.	Cytosine

6 Which of the following would be nucleoside found only in RNA?

1.	Thymidine	2.	Cytidine
3.	Uridine	4.	Adenosine

7 In a strand of nucleic acid, two nucleotides are linked together by:

1. 3' – 5' phosphodiester bond
2. 5' – 3' phosphodiester bond
3. 2' – 5' phosphodiester bond
4. 3' – 1' phosphodiester bond

8 At which position in the ribose is an additional –OH present [with respect to Deoxyribose]?

1.	1'	2.	2'
3.	3'	4.	5'

9 What is another name for thymine?

1.	5 – bromouracil	2.	3 – bromouracil
3.	3 – methyl uracil	4.	5 – methyl uracil

10 The backbone of a polynucleotide chain is made of:

1.	Sugar and nitrogenous bases
2.	Phosphate and nitrogenous bases
3.	Sugar and phosphate
4.	Sugar, phosphate, and nitrogenous bases

11 In the most important nucleosides:

I:	the sugar is a pentose.
II:	the nitrogen-containing compound is either a pyrimidine or a purine.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

12 Deoxythymidine is:

1.	a substituted pyrimidine found only in DNA
2.	a nucleoside monophosphate found only in DNA
3.	a nucleoside found in DNA
4.	a nucleotide formed by chemical modifications in a RNA nucleotide

13 What would not be true for the structure of a polynucleotide chain?

1.	5'-end of polynucleotide chain has a free phosphate moiety at 5'-end of sugar.
2.	3'-end of polynucleotide chain has a free OH group 3'-C of sugar.
3.	The backbone of a polynucleotide chain is formed due to sugar and phosphates.
4.	The nitrogenous bases linked to phosphate moiety project from the backbone.

14 DNA was first identified by:

1.	Friedrich Meischer	2.	Phoebus Levene
3.	Linus Pauling	4.	Erwin Chargaff

15 In 1953, James Watson and Francis Crick, proposed a very simple but famous Double Helix model for the structure of DNA, based on the X-ray diffraction data produced by:

1.	Maurice Wilkins and Rosalind Franklin
2.	Beadle and Tatum
3.	Temin and Baltimore
4.	Avery–MacLeod–McCarty

16 According to Erwin Chargaff, in a double-stranded DNA

1.	The ratios between Adenine and Thymine, and, Guanine and Cytosine are constant and equal.
2.	The ratios between Adenine and Thymine, and, Guanine and Cytosine are constant but are not equal to one.
3.	The ratios between Adenine and Guanine, and, Thymine and Cytosine are constant and equal.
4.	The ratios between Adenine and Guanine, and, Thymine and Cytosine are constant but are not equal to one.

17 "For a double stranded DNA, the ratios between Adenine and Thymine and Guanine and Cytosine are constant and equals one" – this statement is known as:

1. Central dogma of molecular biology
2. Chargaff's rule
3. Tetra-nucelotide hypothesis by Levene
4. Genetic equilibrium

18 The base pairing in a double stranded DNA is correctly described as:

1.	Similar	2.	Identical
3.	Complementary	4.	Synergistic

19 If each strand of a dsDNA acts as a template for a new strand, the two daughter DNAs will be:

1.	Complementary to each other
2.	Identical to the parental DNA
3.	Similar to each other
4.	Complementary to the parental DNA

20 Which of the following is not a feature of the double helix model of DNA?

1.	The two chains have anti-parallel polarity
2.	A purine always comes opposite to a pyrimidine
3.	The pitch of the DNA is 3.4 nm
4.	The two chains are coiled in a left handed fashion

21 The distance between a base pair in the DNA double helix is approximately:

1.	2.0 nm	2.	0.34 nm
3.	20 nm	4.	3.4 nm

22 Consider the two statements:

I:	If the sequence of bases in one strand of a double-stranded DNA is known, then the sequence in other strands can be predicted.
II:	If each strand from a DNA acts as a template for the synthesis of a new strand, the two double-stranded DNA thus, produced would be identical to the parental DNA molecule.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and II are correct	4.	Both **I** and **II** are incorrect

23 How many of the given features will be true for of the double-helix structure of DNA?

I:	It is made of two polynucleotide chains
II:	The backbone is constituted by sugar-phosphate
III:	The two chains have anti-parallel polarity.
IV:	The bases in two strands are paired through hydrogen bonds (H-bonds) forming base pairs (bp)

1. 1
2. 2
3. 3
4. 4

24 Consider the given two statements:

Assertion (A):	The distance between the two strands of the dsDNA helix is uniform.
Reason (R):	Adenine forms two hydrogen bonds with guanine from opposite strand and thymine is bonded with cytosine with three H-bonds.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

25 Consider the given two statements:

Assertion (A):	There is, approximately, a uniform distance between the two strands of the double helix of DNA.
Reason (R):	A purine on one strand comes opposite to a pyrimidine on the other strand of the double helix of DNA.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
2.	**(A)** is False but **(R)** is True.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

26 How many of the given features will be true for of the double-helix structure of DNA?

I:	The two chains are coiled in a right-handed fashion.
II:	The pitch of the helix is 3.4 nm.
III:	The plane of one base pair stacks over the other in a double helix.

1. 0
2. 1
3. 2
4. 3

27 Identify the correct statements regarding salient features of the Double-helix structure of DNA:

I:	Backbone is constituted by nitrogenous bases.
II:	The two chains have anti-parallel polarity.
III.	There is complementary base pairing between nitrogenous bases.
IV.	The two chains are coiled in a left-handed fashion.
V.	The plane of one base pair stacks over the other.

1.	All except **I**	2.	All except **I** and **IV**
3.	Only **II** and **III**	4.	Only **III**

28 The central dogma of molecular biology was proposed by:

1.	Francis Crick	2.	James Watson
3.	Rosalind Franklin	4.	Erwin Chargaff

29 In some viruses, the flow of genetic information is from RNA to DNA. These viruses are:

1.	Reverse transcriptases	2.	Reoviruses
3.	Ribozymes	4.	Retroviruses

30 Reverse transcription is described as:

1.	The synthesis of RNA from a DNA template.
2.	The transcription of mRNA into proteins.
3.	The replication of RNA from an RNA template.
4.	The synthesis of DNA from an RNA template.

31 The length of DNA in a typical mammalian cell is approximately:

1.	1.1 meter	2.	1.5 meter
3.	2.2 meter	4.	3.3 meter

32 In prokaryotes:

1. A typical nucleus is not seen and DNA is scattered throughout the cell
2. A typical nucleus may sometimes be present and DNA is scattered throughout a cell
3. A typical nucleus is not seen but DNA is not scattered throughout the cell
4. A typical nucleus may sometimes be present but DNA is not scattered throughout the cell

33 Histones are:

1. Positively charged and basic amino acids
2. Negatively charged and basic proteins
3. Positively charged and acidic proteins
4. Not found in bacteria

34 Histones are rich in amino acids:

1. Arginine and Lysine
2. Arginine and Leucine
3. Arginine and Isoleucine
4. Aspartate and Glutamate

35 A typical nucleosome unit consists of about:

1. 60 base pairs
2. 140 base pairs
3. 200 base pairs
4. 400 base pairs

36 Nucleosomes constitute the repeating subunits of a structure in the nucleus called:

1. Nucleoid
2. Chromatid
3. Solenoid
4. Chromatin

37 Transcriptionally, active chromatin is termed as:

1. Heterochromatin
2. Euchromatin
3. Prechromatin
4. Prochromatin

38 During DNA packaging in eukaryotic cells, Non-Histone Chromosomal proteins:

1. Are not required
2. Are required from the beginning to the end of the packaging
3. Are required only for earlier stages of packaging
4. Are required for a higher level of packaging

39 Consider the given two statements:

Assertion (A):	In prokaryotes, such as E. coli, the DNA is scattered throughout the cell.
Reason (R):	Prokaryotes, such as E. coli, do not have a defined nucleus.

1. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2. **(A)** is True but **(R)** is False.
3. **(A)** is False but **(R)** is True.
4. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

40 Nucleosome:

I: is formed by the wrapping of negatively charged DNA around the negatively charged histone octamer.
II: typically contains 200 bp of DNA helix.
III: constitutes the repeating unit of a structure in nucleus called chromatin.
IV: is seen as 'beads-on-string' structure when viewed under electron microscope (EM).

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

41 Consider the given two statements:

Assertion (A):	Histones are a set of positively charged, basic proteins.
Reason (R):	Histones are rich in lysine and arginine and both amino acid residues carry positive charges in their side chains.

1. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2. **(A)** is True but **(R)** is False.
3. **(A)** is False but **(R)** is True.
4. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**

42 Consider the given two statements:

Assertion (A):	Euchromatin is said to be transcriptionally active chromatin, whereas heterochromatin is inactive.
Reason (R):	Light stained region of chromatin is euchromatin and dark stained region is heterochromatin.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

THE SEARCH FOR GENETIC MATERIAL

43 In 1928, Frederick Griffith, in a series of experiments with *Streptococcus pneumoniae* (bacterium responsible for pneumonia), discovered:

1.	that DNA is more stable than RNA
2.	that DNA is the genetic material for most living organisms
3.	the process of bacterial transformation
4.	the R and S strains of the bacterium

44 All the following can be logical conclusions of Griffith experiment except:

1.	The R strain bacteria had somehow been transformed by the heat-killed S strain bacteria.
2.	Some 'transforming principle', transferred from the heat-killed S strain, had enabled the R strain to synthesise a smooth polysaccharide coat and become virulent.
3.	The transformation must be due to the transfer of the genetic material.
4.	The biochemical nature of genetic material must be the protein

45 Griffith co-injected the heat-killed S and live R strains of Pneumococcus bacterium into the mice and much to his surprise the mice developed pneumonia and died. He concluded that:

I:	Live R was transformed into Live S strain as he was able to isolate Live S strain from the blood of the infected mice.
II:	Bacterial transformation is a stable and heritable change as the culture of bacteria isolated from dead mice was unable to infect other mice.

1.	Both **I** and **II** are correct
2.	Only **I** is correct
3.	Only **II** is correct
4.	Both **I** and **II** are incorrect

46 In Griffith's experiment, which of the following bacterial strains was capable of causing pneumonia in mice?

1.	Live R
2.	Bacteria strain with polysaccharide coat
3.	Heat Killed S
4.	Live R with capsule and Heat Killed S

47 Griffith's experiment discovered bacterial transformation which in his experiment means:

1.	A mutation in the R strain made them virulent.
2.	A mutation in the S strain made them non-virulent.
3.	A rough strain passed genetic information to a smooth strain.
4.	A smooth strain passed genetic information to a rough strain.

48 Consider the given two statements:

Assertion (A):	When *Streptococcus pneumoniae (pneumococcus)* bacteria are grown on a culture plate, some produce smooth shiny colonies (S) while others produce rough colonies (R).
Reason (R):	Mice infected with the S strain (virulent) die from pneumonia infection but mice infected with the R strain do not develop pneumonia.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

49 Prior to the work of Avery, Macleod, and McCarty, the genetic material was thought to be:

1.	DNA	2.	RNA
3.	Protein	4.	Nucleotide

50 In Avery, Macleod, and McCarty's experiment, the transformation of bacteria was inhibited by:

1.	Proteases	2.	RNase
3.	DNAs	4.	None of these

51 Which of the following will directly support the conclusion derived by Oswald Avery, Colin MacLeod and Maclyn McCarty that DNA caused the bacterial transformation in Griffith's experiment?

I:	Protein-digesting enzymes (proteases) and RNA-digesting enzymes (RNases) did not affect transformation
II:	Digestion with DNase inhibited transformation.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

52 The Avery, McLeod, and McCarty experiment proved that:

1.	Proteins are the hereditary material
2.	RNA is the genetic material in viruses
3.	DNA is the genetic material
4.	Lipids play a crucial role in inheritance

53 The unequivocal proof that DNA is the genetic material was provided by:

1.	Avery, Macleod, and McCarty
2.	Hershey and Chase
3.	Meselson and Stahl
4.	Watson and Crick

54 Viruses grown on radioactive sulfur contain:

1.	Radioactive proteins but not DNA
2.	Radioactive DNA but not proteins
3.	Radioactive proteins and DNA
4.	Nonradioactive DNA and protein

55 Hershey and Chase proved DNA as the genetic material in their experiment because :

1.	Bacteria that were infected with viruses that had radioactive proteins were not radioactive.
2.	Bacteria that were infected with viruses that had radioactive DNA were radioactive.
3.	Both 1 and 2 are correct.
4.	Both 1 and 2 are incorrect.

56 Regarding Hershey and Chase experiment:

Statement I:	Bacteria that were infected with viruses that had radioactive proteins were not radioactive.
Statement II:	Proteins did not enter the bacteria from the viruses.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is incorrect; **Statement II** is incorrect
3.	**Statement I** is correct; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is correct

57 Which of the following two statements can be correctly considered as the conclusions of the Hershey and Chase experiment?

I:	The lack of 35S-labeled DNA remaining in the solution after the bacteriophages had been allowed to adsorb to the bacteria showed that the phage DNA was transferred into the bacterial cell.
II:	The presence of almost all the radioactive 32P in the solution showed that the protein coat that protects the DNA before adsorption stayed outside the cell.

1.	**Only I**	2.	**Only II**
3.	**Both I and II**	4.	**Neither I nor II**

58 In Hershey and Chase experiment:

I:	Radioactive sulfur-35 was used to label the DNA contained in the T_2 phage
II:	Radioactive phosphorus-32 was used to label the protein sections of the T_2 phage

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

59 RNA is not the genetic material in:

1.	Tobacco mosaic virus	2.	QB bacteriophage
3.	HIV	4.	Archaebacteria

60 A molecule that can act as a genetic material must fulfil all the following criteria except:

1.	It should be able to generate its replica
2.	It should chemically and structurally be stable
3.	It should provide scope for rapid mutations
4.	It should be able to express itself in the form of "Mendelian Characters"

61 DNA is structurally and chemically more stable than RNA because of the following except:

1.	It has thymine instead of uracil
2.	2'–OH is absent in DNA
3.	It replicates itself based on complementary base pairing
4.	It does not have any catalytic role

62 Consider the following statements:

I:	RNA is the genetic material of the QB bacteriophage.
II:	DNA chemically is less reactive and more stable than RNA.
III:	Viruses having RNA genomes and shorter life spans mutate & evolve slowly.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

63 The protein synthesizing machinery of a cell has evolved around:

1.	DNA	2.	RNA
3.	Protein itself	4.	Viroids

64 A molecule that can act as a genetic material should be able to generate its replica (Replication). Therefore:

I:	Both the nucleic acids (DNA and RNA) can act as the genetic material.
II:	Proteins cannot act as the genetic material.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

65 Consider the given two statements:

Assertion (A):	Among the two nucleic acids, the DNA and the RNA, DNA is a better genetic material.
Reason (R):	DNA chemically is less reactive and structurally more stable when compared to RNA.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

66 Consider the given two statements:

Statement I:	The two strands of DNA being complementary if separated by heating come together, when appropriate conditions are provided.
Statement II:	The presence of thymine at the place of adenine also confers additional stability to DNA.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

67 Regarding comparison of DNA and RNA:

I:	DNA can directly code for the synthesis of proteins; RNA, however, is dependent on DNA for synthesis of proteins.
II:	DNA is preferred for storage of genetic information; for the transmission of genetic information, RNA is better.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

RNA WORLD

68 The genetic material for the first life on the earth was probably:

1.	ds DNA	2.	ss DNA
3.	Protein	4.	RNA

69 Why is it hypothesized that an "RNA world" existed?

1.	RNA can store genetic information and catalyze chemical reactions.
2.	RNA is more stable and versatile than DNA.
3.	RNA can replicate more quickly than DNA.
4.	RNA forms the structural components of ribosomes.

70 RNA was the first genetic material. Which of the two given evidences support this assertion?

I:	essential life processes (such as metabolism, translation, splicing, etc.), evolved around RNA.
II:	RNA used to act as a genetic material as well as a catalyst.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

REPLICATION

71 "It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material" (Watson and Crick, 1953). What will be true regarding he statement quoted?

I:	The 'specific pairing' refers to complementary base pairing.
II:	The 'possible copying mechanism' refers to conservative mechanism of DNA replication.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 The complementary base pairing ensure which of the following features of a DNA double helix?

1. the antiparallel nature
2. the semiconservative nature
3. uniform diameter
4. uniform length

73 Who proposed a semi-conservative mode for the replication of DNA molecule?

1. Meselson and Stahl
2. Watson and Crick
3. Beadle and Tatum
4. Temin and Baltimore

74 What radioactive isotope was used by Meselson and Stahl to label DNA in their experiment?

1.	^{35}S	2.	^{15}N
3.	^{32}P	4.	None

75 The density gradient in Meselson and Stahl's experiment was of:

1.	NH_4Cl	2.	CsCl
3.	KCl	4.	$BaCl_2$

76 If *E. coli* was allowed to grow for 60 minutes after transfer from 15N to 14N medium, the number of hybrid density DNA molecules would be:

1. 2
2. 4
3. 6
4. 8

77 The daughter DNA that was extracted from the culture one generation after the transfer from ^{15}N to ^{14}N medium had:

1.	Low density
2.	Intermediate density
3.	High density
4.	One had low and another had high density

78 If *E.coli* was allowed to grow for 80 minutes after transfer from ^{15}N to ^{14}N medium, the number of hybrid density DNA molecules would be:

1.	2	2.	16
3.	14	4.	8

79 Taylor conducted experiments to prove the semiconservative mode of chromosome replication on:

1.	*E. coli*	2.	*Vinca* rosea
3.	Vicia faba	4.	*Drosophila melanogaster*

80 The DNA dependent polymerases catalyze:

1.	Only in 3' – 5' direction
2.	Only in 5' – 3' direction
3.	In both directions
4.	In neither directions

81 *E.coli* has only 4.6×10^6 base pairs and completes the process of replication within 18 minutes, then the average rate of polymerization is approximately:

1.	2000 base pairs/second	2.	3000 base pairs/second
3.	4000 base pairs/second	4.	1000 base pairs/second

82 Consider the given two statements:

Assertion (A):	Deoxyribonucleoside triphosphates provide energy for polymerisation reaction during DNA replication.
Reason (R):	Energetically replication of DNA is a very expensive process.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

83 During DNA replication, deoxyribonucleoside triphosphates function as

A: Substrates
B: Source of energy

1. Only **A** is correct
2. Only **B** is correct
3. Both **A** and **B** are correct
4. Both **A** and **B** are incorrect

84 Consider the following statements:

I.	Deoxyribonucleoside triphosphates act as substrates as well as provide energy for polymerization reaction during DNA replication.
II.	The replication of DNA is both semiconservative and semi-discontinuous
III.	In bacterial DNA replication, there are multiple ori and replication fork moving bi-directionally

Which of the above statements are true?

1.	**I and II only**	2.	**I and III only**
3.	**II and III only**	4.	**I, II and III**

85 During DNA replication, the leading strand is synthesized:

1.	In the 5' to 3' direction, continuously.
2.	In the 3' to 5' direction, continuously.
3.	In the 5' to 3' direction, in fragments.
4.	In the 3' to 5' direction, in fragments.

86 DNA-dependent DNA polymerases do not:

1.	synthesize RNA to prime DNA synthesis
2.	have exonuclease activity
3.	possess proofreading capabilities
4.	synthesize DNA in a 5' to 3' direction

87 DNA replication is correctly described as:

1.	Semi-conservative and Continuous
2.	Semi-conservative and Discontinuous
3.	Conservative and Continuous
4.	Semi-conservative and Semi-discontinuous

88 The discontinuously synthesized DNA fragments are later joined by:

1.	DNA helicase	2.	Topoisomerase
3.	DNA ligase	4.	DNA polymerase

89 Consider the given two statements:

Assertion (A):	On one strand, the template with polarity 3' - 5', the DNA replication is discontinuous, while on the other, the template with polarity 5' -3', it is continuous.
Reason (R):	The DNA-dependent DNA polymerases catalyse polymerisation only in one direction that is, 5' - 3'.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is False but **(R)** is True.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

90 A failure in cell division after DNA replication results in:

1.	Point mutation	2.	Aneuploidy
3.	Polyploidy	4.	Apoptosis

91 Consider the given two statements:

Statement I:	A piece of DNA, if needed to be propagated during recombinant DNA procedures, requires a vector.
Statement II:	There is a definite region in DNA where the replication originates.

1. **Statement I** is correct, **Statement II** is correct
2. **Statement I** is correct, **Statement II** is incorrect
3. **Statement I** is incorrect, **Statement II** is correct
4. **Statement I** is incorrect, **Statement II** is incorrect

92 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The replication of DNA and cell division cycle should be highly coordinated.
Reason (R):	In Eukaryotes, the replication of DNA takes place at S-phase of the cell cycle.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True but **(R)** is False.

TRANSCRIPTION

93 Principle of complementarity governs

I: Transcription

II: DNA replication

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

94 Regarding transcription:

I:	The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.
II:	The principle of complementarity governs the process of transcription.
III:	Only a segment of DNA and only one of the strands is copied into RNA.

1.	Only **I** and **II** are correct
2.	Only **I** and **III** are correct
3.	Only **II** and **III** are correct
4.	**I, II** and **III** are correct

95 Consider the given two statements:

Assertion (A):	It is necessary to define the boundaries that would demarcate the region and the strand of DNA that would be transcribed.
Reason (R):	Unlike replication, the principle of complementarity does not govern the process of transcription.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

96 Consider the given two statements:

Assertion (A):	If both strands of DNA act as a template, they would code for RNA molecule with different sequences.
Reason (R):	Complementarity does not mean identical.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is False but **(R)** is True.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**

97 Both strands of DNA are not copied during transcription. What would happen if it were not so?

I:	One segment of the DNA would be coding for two different proteins, and this would complicate the genetic information transfer machinery.
II:	The two RNA molecules, if produced simultaneously, would be complementary to each other, hence would form a double stranded RNA, making such transcription a futile exercise.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

98 A transcription unit does not contain:

1.	Promoter	2.	Operator
3.	Structural gene	4.	Terminator

99 In a transcription unit, with respect to structural genes, the promoter is located:

1.	Upstream and 5'	2.	Upstream and 3'
3.	Downstream and 5'	3.	Downstream and 3'

100 What defines a coding and a template strand in the transcription unit?

1.	Structural gene	2.	Ori
3.	Terminator	4.	Promoter

101 Consider the following statements:

I:	All the reference point while defining a transcription unit is made with the coding strand.
II:	It is the presence of a promoter in a transcription unit that also defines the template and coding strands.
III:	Exons are said to be sequences that do not appear in mature or processed RNA.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

102 In a transcription unit, RNA polymerase binds to:

1.	Ori	2.	Promoter
3.	Operator	4.	Structural gene

103 In most prokaryotes, the transcription unit is:

1.	Mono-cistronic	2.	Poly-cistronic
3.	Multi-cistronic	4.	Uni-cistronic

104 There is a convention in defining the two strands of the DNA in the structural gene of a transcription unit where:

I:	the strand which has the polarity 3'→5' acts as a template and is also referred to as template strand.
II:	the strand which has the polarity (5'→3') and does not code for anything is referred to as the coding strand.

1.	Only I is correct
2.	Only II is correct
3.	Both I and II are correct
4.	Both I and II are incorrect

105 At any instant, RNA is transcribed on which of the following strands of DNA?

1.	Coding strand	2.	Template strand
3.	Lagging strand	4.	Leading strand

106 A segment of DNA coding for a polypeptide is most accurately defined as:

1.	Operon	2.	Gene
3.	Recon	4.	Cistron

107 In eukaryotes, the sequences that appear in mature or processed mRNA are called:

1.	Introns	2.	Cistrons
3.	Exons	4.	Mutons

108 Eukaryotic genes are split genes. A DNA sequence within such a gene that is not expressed in the final RNA product is called:

1. Exons
2. Transposons
3. Recons
4. Introns

109 Consider the given two statements:

Statement I:	The structural gene in a transcription unit is monocistronic, mostly, in bacteria or prokaryotes.
Statement II:	The structural gene in a transcription unit is polycistronic, mostly, in eukaryotes.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

110 In the mature mRNA in eukaryotes:

1. exons and introns do not appear
2. exons appear but introns do not appear
3. introns appear but exons do not appear
4. both exons and introns appear

111 A gene:

I:	is defined as the functional unit of inheritance.
II:	can also be defined as DNA sequences coding for tRNA or rRNA.
III:	can also be defined as certain regulatory sequences.

1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

112 All three major cellular RNAs are needed to synthesise a protein in a cell where:

I:	mRNA provides the template
II:	tRNA brings amino acids and reads the genetic code
III:	rRNAs play structural and catalytic role during translation

1. Only I is correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

113 Regarding bacterial RNA polymerase:

I:	There is a single DNA-dependent RNA polymerase that catalyzes the transcription of all types of RNA.
II:	RNA polymerase associates transiently with initiation-factor (σ) and termination-factor (ρ) to initiate and terminate the transcription, respectively.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

114 Which of the following RNAs plays both structural and catalytic roles?

1.	mRNA	2.	tRNA
3.	rRNA	4.	miRNA

115 What facilitates the opening of the helix during the elongation step of transcription?

1.	RNA polymerase	2.	Helicase
3.	Topoisomerase	4.	Gyrase

116 The core RNA polymerase is capable of catalyzing which steps of transcription?

1.	Initiation only	2.	Elongation only
3.	Termination only	4.	All of these

117 Consider the given two statements:

Assertion (A):	DNA replication and transcription can be coupled in a bacteria.
Reason (R):	Identical enzymes are used for replication and transcription in prokaryotes.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

118 Consider the given two statements:

Assertion (A):	Transcription and translation can be coupled in bacteria.
Reason (R):	In bacteria, mRNA does not require any processing to become active, and transcription and translation take place in the same compartment.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

119 In eukaryotes RNA polymerase II transcribes:

1.	mRNA	2.	rRNA
3.	tRNA	4.	hnRNA

120 In eukaryotic transcription:

I:	There are at least three RNA polymerases in the nucleus (in addition to the RNA polymerase found in the organelles).
II:	hnRNA undergoes modification to produce mature RNA.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

121 In eukaryotes, RNA polymerase I transcribes all the following except:

1.	28S rRNA	2.	8S rRNA
3.	5.8S rRNA	4.	5S rRNA

122 Match the following RNA polymerases with their primary transcripts in eukaryotes:

	Column I		Column II
A.	RNA Polymerase I	P.	mRNA
B.	RNA Polymerase II	Q.	rRNA
C.	RNA Polymerase III	R.	tRNA

Codes:

	A	B	C
1.	Q	R	P
2.	P	Q	R
3.	Q	P	R
4.	P	R	Q

123 Eukaryotic RNA polymerase III does not transcribe:

1. tRNA
2. hnRNA
3. 5srRNA
4. snRNA

124 The process of RNA splicing shows the dominance of:

1.	DNA world	2.	RNA world
3.	Protein world	4.	Microbial world

125 In RNA splicing:

1.	Exons are removed and introns are joined together
2.	Introns are removed and exons are joined together
3.	Cistrons are removed and introns are joined together
4.	Introns are removed and Cistrons are joined together

126 What is added to the 5' end of hnRNA in Eukaryotes?

1.	Poly A tail
2.	Methyl cytosine triphosphate
3.	Methyl guanosine triphosphate
4.	Poly U tail

127 Consider the given two statements:

Assertion (A):	In eukaryotes, transcription involves the formation of a pre-mRNA which is then processed to form mature mRNA.
Reason (R):	The processing includes splicing out introns, addition of a 5' cap, and a poly-A tail to the pre-mRNA.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is True.

128 Consider the given two statements

Assertion (A):	The process of transcription and translation can be coupled in bacterial cells.
Reason (R):	Bacterial cells can carry out splicing and other post-transcriptional modifications in the hnRNA.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True, **(R)** is False.
4.	**(A)** is False, **(R)** is False.

129 During post-transcriptional modification of hnRNA in eukaryotes:

I:	Capping is done at the 5' end and tailing at the 3' end
II:	Exons are removed from the split gene to form the cistron

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

GENETIC CODE

130 Who suggested that the genetic code should be made of three nucleotides?

1.	Gamow	2.	Severo Ochoa
3.	Hargobind Khorana	4.	Marshall Nirenberg

131 Whose cell free system finally helped the genetic code to be deciphered?

1.	Gamow	2.	Severo Ochoa
3.	Hargobind Khorana	4.	Marshall Nirenberg

132 Identify the correctly matched pairs:

	Scientist	Contribution in deciphering genetic code
I:	Hargobind Khorana	Developed chemical method for synthesising RNA molecules with defined combinations of bases.
II:	Marshall Nirenberg	Created cell-free system to facilitate study.

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

133 Which enzyme polymerizes RNA with defined sequences in a template independent manner?

1.	Peptidyl transferase
2.	RNA polymerase
3.	Reverse transcriptase
4.	Polynucleotide phosphorylase

134 Consider the given two statements:

Assertion (A):	Errors in the third position of the triplet codon usually cause only a silent mutation or an error that would not affect the protein.
Reason (R)	The genetic code is a triplet code.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

135 How many of the following statements regarding the salient features of genetic code are true?

I:	The codon is triplet.
II:	61 codons code for amino acids and 3 codons do not code for any amino acids.
III:	The code is degenerate.
IV:	There are punctuations when reading the code.
V:	The code is nearly universal.
VI:	AUG has dual functions.

1. 3
2. 4
3. 5
4. 6

136 There is only a single mRNA codon for tryptophan, that is

1.	UAC	2.	UGG
3.	UUU	4.	UAG

137 Identify the correct statement regarding genetic code:

1. AUG is the termination codon
2. UAG is an initiator codon
3. Genetic code is ambiguous
4. Genetic code is degenerate

MOLECULAR BASIS OF INHERITANCE

138 AUG codon: -

a. codes for methionine
b. is an initiation codon
1. Only a is correct
2. Only b is correct
3. Both a and b are correct
4. Both a and b are incorrect

139 Some amino acids are coded by more than one codon. Hence genetic code is:

1.	Unambiguous	2.	Non-specific
3.	Degenerate	4.	Universal

140 In the genetic code, the codon UUC codes for:

1.	Methionine	2.	Phenylalanine
3.	Tyrosine	4.	Valine

141 Match each item in Column I with one item in Column II and chose your answer from the codes given below.

Column I (mRNA codons)		Column II (Amino acid)	
I.	GUG	1.	Tryptophan
II.	UGG	2.	Valine
III.	UAC	3.	Glutamic acid
IV.	GAG	4.	Tyrosine

Codes:

Options:	I	II	III	IV
1.	1	2	3	4
2.	2	1	4	3
3.	2	1	3	4
4.	1	2	4	3

142 Which of the following is not a stop codon?

1.	UAA	2.	UGA
3.	UAC	4.	UAG

143 Which amino acid is coded for by six mRNA codons?

1.	Glycine	2.	Alanine
3.	Leucine	4.	Proline

144 Which of the following is not an mRNA codon for glycine?

1. GGG
2. GGC
3. GGU
4. GUG

145 During translation in living cells, every polypeptide chain formed starts with the amino acid:

1.	lysine	2.	serine
3.	methionine	4.	alanine

146 What would have been the number of possible codons if the universal genetic code were a four letter code instead of being a three letter code?

1. 64
2. 128
3. 216
4. 256

147 Identify the incorrectly matched pair:

A. UUU – phenylalanine
B. GGG – Glycine
C. AAA – Proline
D. CCC – Lysine
1. A and B
2. C and D
3. A and C
4. B and D

148 Insertion or deletion of how many bases will not cause a frameshift mutation?

1.	1	2.	2
3.	3	4.	Any number

149 Consider the given two statements:

Assertion (A):	From the very beginning of the proposition of code, it was clear to Francis Crick that there has to be a mechanism to read the code and also to link it to the amino acids.
Reason (R):	The tRNA is the adapter molecule.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

150 Consider the given two statements:

Assertion (A):	The rRNA acts as an adapter molecule in the flow of genetic information in animal cells.
Reason (R):	The rRNA can read genetic code uniquely but only in animal cells.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

151 Which of the following is also called soluble RNA?

1.	tRNA	2.	rRNA
3.	mRNA	4.	siRNA

152 Identify the correct statements regarding the tRNA molecule:

a.	tRNA has an anticodon loop that has bases complementary to the code.
b.	tRNA has an amino acid acceptor end at the 5' end to which it binds to amino acids.
c.	tRNAs are specific for each amino acid.
d.	There are no tRNAs for stop codons.

1. Only a, b and c
2. Only a, c and d
3. Only b, c and d
4. a, b, c, and d

153 The amino acid acceptor arm of the tRNA is at its:

1.	DHU loop	2.	TψC loop
3.	5' end	4.	3' end

154 In actual structure, the tRNA is a compact molecule which looks like

1. A clover leaf
2. Inverted L
3. Beta-plated sheet
4. A triple helix

155 The clover leaf model structure describes the:

1.	the secondary structure of tRNA.
2.	the actual structure of tRNA.
3.	the assembly of tRNAs at the larger subunit of ribosomes
4.	motifs formed by unusual bases in tRNA.

TRANSLATION

156 Consider the given two statements:

Assertion (A):	The order and sequence of amino acids in a polypeptide are defined by the sequence of bases in the mRNA.
Reason (R):	The mRNA is formed in a template independent manner in eukaryotes.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

157 Consider the given two statements:

Assertion (A):	In the first phase of translation itself, amino acids are activated in the presence of ATP.
Reason (R):	If two such charged tRNAs are brought close enough, the formation of peptide bond between them would be favoured energetically.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is False but **(R)** is True.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**

158 How many of the given statements regarding ribosomes are correct?

I:	Ribosomes are the cellular factory responsible for synthesising proteins.
II:	The ribosome consists of structural RNAs and about 800 different proteins.
III:	In its inactive state, it exists as two subunits; a large subunit and a small subunit.
IV:	When the small subunit encounters an mRNA, the process of translation of the mRNA to protein begins.

1. 1
2. 2
3. 3
4. 4

159 A translational unit is:

1.	found on mRNA and is flanked by a promoter and a terminator
2.	found on rRNA and is flanked by a promoter and a terminator
3.	found on mRNA and is flanked by a start codon and a stop codon
4.	found on rRNA and is flanked by a start codon and a stop codon

160 Which of the following functions as an enzyme to catalyse peptide bond formation in prokaryotes?

1. 5SrRNA
2. 5.8SrRNA
3. 23SrRNA
4. 28SrRNA

161 During translation, which of the following molecules acts as an adaptor?

1. mRNA
2. tRNA
3. rRNA
4. miRNA

162 Which of the following describes the steps of translation correctly?

1.	mRNA binds to tRNA, which brings amino acids to the ribosome.
2.	tRNA binds to mRNA in ribosomes, and amino acids are linked together to form proteins.
3.	rRNA catalyzes peptide bond formation between amino acids.
4.	mRNA is synthesized from a DNA template, which then undergoes translation to form a protein.

163 Which of the following statements about bacterial translation is correct?

1.	The ribosome binds to the 5' cap structure of the mRNA to initiate translation.
2.	In bacteria, translation begins with the amino acid methionine, always encoded by the start codon AUG.
3.	Bacterial mRNAs have poly-A tails that signal the end of translation.
4.	Eukaryotic and bacterial ribosomes are identical and function in the same manner.

164 Which enzyme catalyzes the bonding between specific tRNAs and the amino acids that their anticodon sequences call for?

1. Severo Ochoa enzyme
2. Polynucleotide phosphorylase
3. Aminoacyl-tRNA synthetase
4. Telomerase

165 What catalyzes the peptide bond formation in prokaryotes?

1. Proteases
2. A ribozyme
3. Sigma subunit of RNA polymerase
4. Rho factor proteins

166 Consider the following statements:

I:	The cellular factory responsible for synthesizing proteins is the ribosome.
II:	The ribosome also acts as a catalyst for the formation of a peptide bond.
III:	The UTRs (untranslated regions) in an mRNA are not required for translation.

Which of the above statements are true?

1.	**I and II only**	2.	**I and III only**
3.	**II and III only**	4.	**I, II, and III**

167 The untranslated regions:

I:	are present at only the 5' end of the mature mRNA in eukaryotes
II:	are not required during translation and hence are spliced out of the mature mRNA

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

REGULATION OF GENE EXPRESSION

168 Although gene expression in eukaryotes can take place at multiple levels. The most common level of gene expression would be:

1.	transcriptional level (formation of the primary transcript)
2.	processing level (regulation of splicing)
3.	transport of mRNA from the nucleus to the cytoplasm
4.	translational level

169 Identify the correct statements:

I:	It is the metabolic, physiological, or environmental conditions that regulate the expression of genes.
II:	The development and differentiation of embryos into adult organisms are also a result of the coordinated regulation of the expression of several sets of genes.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

170 Gene regulation in prokaryotes is carried out exclusively at the level of:

1.	Initiation of transcription
2.	Post-transcriptional modifications
3.	Translation
4.	Post-translational modifications

171 In a transcription unit, the activity of RNA polymerase at a given promoter is regulated by interaction with accessory proteins called:

1. Enhancers and Silencers
2. Operators and CAP
3. Rho factors and Sigma factors
4. Activators and Repressors

172 Identify the incorrect statement:

I:	The operator region is adjacent to the promoter elements in most operons and in most cases the sequences of the operator bind a repressor protein.
II:	Each operon has its specific operator and specific repressor.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

173 The first to elucidate a transcriptionally regulated system of gene expression were:

1. Jacob and Monod
2. Nirenberg and Khorana
3. Tijo and Levan
4. Beadle and Tatum

174 In an operon:

1.	a polycistronic structural gene is regulated by a common promoter and regulatory genes.
2.	the regulation in gene expression is always negative and inducible.
3.	the number of structural genes in eukaryotes is much higher than the number of genes in prokaryotic operon.
4.	the role of RNA polymerase is actually performed by accessory proteins like activators and repressors

175 The repressor of the lac operon is:

1.	Lactose itself	2.	A steroid
3.	Synthesized constitutively	4.	A product of structural gene

176 The lac Y gene codes for permease, which increases the permeability of the cell to:

1.	Glucose	2.	Galactose
3.	cAMP	4.	β-galactosides

177 A very low level of expression of the lac operon has to be present in the cell:

1.	When lactose is present	2.	When lactose is absent
3.	When glucose is absent	4.	All the time

178 The lac operon is regarded as:

1.	Negative, Inducible	2.	Negative, Repressible
3.	Positive, Inducible	4.	Positive, Repressible

179 Consider the following statements:

I:	In prokaryotes, control of the rate of transcriptional initiation is the predominant site for control of gene expression.
II:	Regulation of lac operon by CAP is referred to as negative regulation.
III:	The inducer of the lac operon is lactose.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

MOLECULAR BASIS OF INHERITANCE

180 The lac operon consists of one regulatory gene - the i gene – where the term i refers to:

1.	inducer	2.	inhibitor
3.	initiator	4.	intermediate

181 Consider the given two statements:

Assertion (A):	Regulation of lac operon by repressor is referred to as negative regulation.
Reason (R):	Essentially, regulation of lac operon can also be visualised as regulation of enzyme synthesis by its substrate.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is False but **(R)** is True.

182 Which of the following is synthesised all-the-time – constitutively in *E .coli*?

1. repressor of the lac operon
2. beta galactosidase
3. permease
4. transacetylase

183 Which of the following statements will be true regarding the effect of mutations in the components of the lac operon of *E. coli* [assume mutations will lead to loss of function in the affected gene]?

I:	A mutation in the i gene will lead to a stoppage of transcription of the operon.
II:	A mutation in the z gene will lead to an inability in *E .coli* to hydrolyze the disaccharide, lactose.
III:	A mutation in the y gene will lead to an inability in *E. coli* to pick up lactose from its surroundings.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

184 If *E. coli* do not have lactose around them to be utilised for energy source, they would:

1.	not be able to survive.
2.	be able to survive but not replicate at a fast rate.
3.	no longer require the synthesis of the enzyme beta-galactosidase.
4.	continue to synthesise transacetylase and permease, but not beta galactosidase.

185 In the presence of an inducer, such as lactose or allolactose:

1.	the repressor of lac operon is activated allowing RNA polymerase access to the promoter and transcription proceeds.
2.	the repressor of lac operon is inactivated preventing RNA polymerase access to the promoter and transcription stops.
3.	the repressor of lac operon is inactivated allowing RNA polymerase access to the promoter and transcription proceeds.
4.	the repressor of lac operon is activated allowing RNA polymerase access to the promoter and transcription stops.

186 Any mutation in lac Z gene in E.coli:

1. will have no effect on the cells
2. will make cells impermeable to beta galactosides
3. will make cell unable to metabolize lactose
4. will kill the cell immediately

187 Consider the given two statements:

Assertion (A):	The lac operon will not be transcribed if lactose is absent.
Reason (R):	Lactose is the inducer of the lac operon.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

188 If glucose is not present and if lactose is present, the lac repressor:

1. gets synthesized in larger quantities.
2. gets inactivated.
3. binds more tightly to the operator.
4. stimulates the catabolite activator protein.

189 The structural genes of the lac operon in E.coli do not include:

1.	lac A	2.	lac I
3.	lac Y	4.	lac Z

HUMAN GENOME PROJECT

190 The goals of the Human Genome Project include all the following except:

1.	Identify all the approximately 20,000-25,000 genes in human DNA and determine the sequences of the 3 billion chemical base pairs that make up human DNA.
2.	Store the information in databases, improve tools for data analysis, and transfer related technologies to other sectors, such as industries.
3.	Address the ethical, legal, and social issues (ELSI) that may arise from the project.
4.	Develop technology to enable the introduction of genes into humans to manipulate their phenotypes and allow humans to demand a tailor-made gene composition for themselves.

191 Which fact regarding the Human Genome Project is not correct?

1.	The Human Genome Project was a 13-year project coordinated by the U.S. Department of Energy and the National Institute of Health.
2.	Many non-human model organisms, such as bacteria, yeast, *Caenorhabditis Elegans* (a free-living non-pathogenic nematode), Drosophila (the fruit fly), plants (rice and *Arabidopsis*), etc., have also been sequenced.
3.	The sequence of chromosome 1 was completed only in May 2016 (this was the last of the 24 human chromosomes – 22 autosomes and X and Y – to be sequenced).
4.	The fragments were sequenced using automated DNA sequencers that worked on the principle of a method developed by Frederick Sanger.

192 Identify the correctly matched pairs:

A:	Expressed Sequence Tags	Fragments of mRNA sequences derived through single sequencing reactions performed on randomly selected clones from cDNA libraries.
B:	Sequence Annotations	The process of marking specific features in a DNA, RNA, or protein sequence with descriptive information about structure or function.

1.	Only A	2.	Only B
3.	Both A and B	4.	Neither A nor B

193 The last of 24 human chromosomes to be sequenced was:

1. Chromosome 1 and completed in 2003
2. Chromosome 1 and completed in 2006
3. Chromosome X and completed in 2003
4. Chromosome X and completed in 2006

194 A major advantage of using YAC as a cloning vector over the plasmids is that :

1. it can replicate independently
2. it can be selected easily
3. it can accommodate larger inserts
4. it has multiple cloning sites

195 Which of the following is not a feature of the human genome?

1.	The human genome contains 3164.7 million nucleotide bases.
2.	The largest human gene of dystrophin has about 2.4 million bases.
3.	The total number of genes in the human genome is much higher than the previous estimates.
4.	Less than 2 % of the genome codes for proteins.

196 The salient features of the human genome include all of the following except:

1.	The functions are unknown for over 50 % of the discovered genes.
2.	More than 2 % of the genome codes for proteins.
3.	Chromosome 1 has the most genes.
4.	Repeated sequences make up a very large portion of the human genome.

197 In the human genome, the chromosomes with the most and the fewest genes located on them respectively are:

1.	1 and Y	2.	X and Y
3.	21 and X	4.	11 and Y

198 Consider the following statements:

I:	The largest known human gene is dystrophin at 2.4 million bases.
II:	Repeated sequences make up a very large portion of the human genome.
III:	There are about 2.4 million locations where single-base DNA differences occur in humans.

Which of the above statements are true?

1.	**I and II only**	2.	**I and III only**
3.	**II and III only**	4.	**I, II, and III**

199 All the following are features of the human genome except:

1.	The functions are unknown for over 50 per cent of the discovered genes.
2.	Less than 2 per cent of the genome codes for proteins.
3.	Repeated sequences make up very large portion of the human genome.
4.	Scientists have identified about 4.1 million locations where single-base DNA differences (SNPs – single nucleotide polymorphism, pronounced as 'snips') occur in humans.

200 BAC and YAC have been used in:

1.	the first instance of using DNA profiling in a criminal case.
2.	cloning fragments of DNA in sequencing the Human Genome.
3.	making plants capable of fixing atmospheric nitrogen.
4.	production of pesticide resistant plants.

201 Consider the given two statements:

Assertion (A):	HGP [Human Genome Project] was closely associated with the rapid development of a new area in biology called Bioinformatics.
Reason (R):	The enormous amount of data expected to be generated also necessitated the use of high speed computational devices for data storage and retrieval, and analysis.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is False but **(R)** is True.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

202 Consider the given two statements:

Assertion (A):	For sequencing, the total DNA from a cell is isolated and converted into random fragments of relatively smaller sizes.
Reason (R):	DNA is a very long polymer, and there are technical limitations in sequencing very long pieces of DNA.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is False but **(R)** is True.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

203 Many non-human model organisms have also been sequenced even before sequencing of human genome where:

I:	*Caenorhabditis elegans* is a pathogenic nematode
II:	*Arabidopsis thaliana* is a fungus

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

204 In how many base sequences would there be differences in human genome?

1. 3×10^3 bp
2. 3×10^6 bp
3. 3×10^9 bp
4. 3×10^{12} bp

205 The important goals of HGP included all of the following, except:

1.	Identify all the approximately 20,000–25,000 genes in human DNA
2.	Determine the sequences of the 3 billion chemical base pairs that make up human DNA
3.	Develop technology for cloning of human beings
4.	Address the ethical, legal, and social issues (ELSI) that may arise from the project.

206 Salient observations drawn from the human genome project include all of the following, except:

1.	The human genome contains 3164.7 million bp.
2.	The average gene consists of 3000 bases, but sizes vary greatly, with the largest known human gene being dystrophin at 2.4 million bases.
3.	The total number of genes is estimated at 80,000 to 1,40,000 genes.
4.	Almost all (99.9 per cent) nucleotide bases are exactly the same in all people.

207 The Human Genome Project:

I:	started in 1990
II:	was completed in 2003
III:	aimed to clone a human being in near future

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

208 Which chromosomes, respectively, have the highest and least number of genes located in them?

1. Chromosome 21 and Y
2. Chromosome 1 and X
3. Chromosome 1 and Y
4. Chromosome X and Y

209 Which of the following is not a salient feature of human genome?

1.	Repeated sequences make up very large portion of human genome.
2.	Chromosome 1 has most genes and the Y has the fewest.
3.	The average gene consists of 30,000 bases.
4.	Scientists have identified about 1.4 million locations where single base differences occur in humans.

210 Which scientist received Nobel prize twice - once for structure of proteins and once for genome sequencing?

1. Linus Pauling
2. Fred Sanger
3. Kary Mullis
4. Thomas Cech

DNA FINGERPRINTING

211 Consider the given two statements:

Assertion (A):	Repetitive satellite DNA sequences are very useful identification tools in forensic applications.
Reason (R):	These sequences normally do not code for any proteins, but they form a large portion of human genome.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

212 Satellite DNA:

1. Form a small portion of the human genome
2. Code for proteins that are essential for survival
3. Code for proteins that are not essential for survival
4. Show a high degree of polymorphism

213 What will not be true for satellite DNA?

1.	Satellite DNA forms small peaks other than the bulk DNA during density gradient centrifugation.
2.	Depending on the base composition (A: T rich or G: C rich), length of the segment, and the number of repetitive units, the satellite DNA is classified into many categories, such as micro-satellites, mini-satellites etc.
3.	These sequences normally do not code for any proteins, but they form a large portion of the human genome.
4.	These sequences do not show any polymorphism and form the basis of DNA fingerprinting.

214 What will not be true regarding polymorphism in DNA?

1.	Polymorphism (variation at the genetic level) arises due to mutations.
2.	Allelic sequence variation has traditionally been described as a DNA polymorphism if more than one variant (allele) at a locus occurs in the human population with a frequency greater than 1.00.
3.	The probability of polymorphic variation to be observed in non-coding DNA sequence would be higher as mutations in these sequences may not have any immediate effect/impact on an individual's reproductive ability.
4.	For evolution and speciation, polymorphisms play a very important role.

215 Consider the given two statements:

Assertion (A):	DNA fingerprinting is the basis of paternity testing in cases of disputes.
Reason (R):	Polymorphism evaluated in DNA fingerprinting are inheritable from parents to children.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is False

216 Consider the given two statements:

Assertion (A):	DNA fingerprinting is the basis of paternity testing, in case of disputes.
Reason (R):	DNA from every tissue (such as blood, hair-follicle, skin, bone, saliva, sperm etc.), from an individual show the same degree of polymorphism.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

217 The technique of DNA fingerprinting was developed initially by:

1.	Alfred Sturtevant	2.	Alec Jeffrys
3.	Thomas Cech	4.	Fire and Mello

218 Arrange the given steps in the process of DNA fingerprinting in correct chronological order [from earliest to last]:

(i)	isolation of DNA
(ii)	separation of DNA fragments by electrophoresis
(iii)	digestion of DNA by restriction endonucleases
(iv)	hybridisation using labelled VNTR probe
(v)	detection of hybridised DNA fragments by autoradiography
(vi)	transferring (blotting) of separated DNA fragments to synthetic membranes, such as nitrocellulose or nylon

1.	(i) – (ii) – (iii) – (vi) – (iv) – (v)
2.	(i) – (iii) – (ii) – (vi) – (iv) – (v)
3.	(ii) – (iii) – (i) – (vi) – (v) – (iv)
4.	(iii) – (i) – (ii) – (v) – (iv) – (vi)

219 Southern blotting is transfer to nitrocellulose sheet from agar gel of:

1.	RNA	2.	Proteins
3.	DNA	4.	Lipids

220 Transfer of electrophoresis-separated DNA fragments to a filter membrane and subsequent fragment detection by probe hybridization is called as:

1.	DNA profiling	2.	PCR
3.	Southern blotting	4.	Elution

221 The size of VNTR [used in DNA fingerprinting] varies from:

1.	0.1 to 20 kb	2.	20 to 30 kb
3.	50 to 100 kb	4.	115 to 215 kb

222 RFLP in DNA fingerprinting utilizes the polymorphism in:

1.	SNPs	2.	VNTRs
3.	LINES	4.	SINES

223 The VNTR belongs to a class of satellite DNAs and is referred to as:

1.	Micro satellite	2.	Mini-satellite
3.	STRs	4.	SNPs

224 If variations arising due to mutation need to spread to the other members of population:

I: the mutation must arise in somatic cells.

II: the mutation must arise in germ cells.

III: the mutation does not seriously impair individual's ability to have offspring who can transmit the mutation.

1.	Only I and II are correct
2.	Only I and III are correct
3.	Only II and III are correct
4.	I, II and III are correct

225 Consider the given two statements:

Assertion (A):	Today, DNA from a single cell is enough to perform DNA fingerprinting analysis.
Reason (R):	The sensitivity of the technique has been increased by the use of polymerase chain reaction.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.

226 Polymorphism in DNA sequence is the basis of:

I:	genetic mapping of human genome
II:	DNA fingerprinting

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

227 DNA fingerprinting involves identifying differences in some specific regions in DNA sequence called as:

1. repetitive DNA
2. satellite DNA
3. genomic DNA
4. complementary DNA

MOLECULAR BASIS OF INHERITANCE - ANSWER KEY

1.	(4)	2.	(2)	3.	(1)	4.	(3)	5.	(4)	6.	(3)	7.	(1)	8.	(2)	9.	(4)	10.	(3)
11.	(3)	12.	(3)	13.	(4)	14.	(1)	15.	(1)	16.	(1)	17.	(2)	18.	(3)	19.	(2)	20.	(4)
21.	(2)	22.	(3)	23.	(4)	24.	(2)	25.	(4)	26.	(4)	27.	(2)	28.	(1)	29.	(4)	30.	(4)
31.	(3)	32.	(3)	33.	(4)	34.	(1)	35.	(3)	36.	(4)	37.	(2)	38.	(4)	39.	(3)	40.	(3)
41.	(4)	42.	(1)	43.	(3)	44.	(4)	45.	(2)	46.	(2)	47.	(4)	48.	(2)	49.	(3)	50.	(4)
51.	(2)	52.	(3)	53.	(2)	54.	(1)	55.	(2)	56.	(3)	57.	(4)	58.	(4)	59.	(4)	60.	(3)
61.	(3)	62.	(1)	63.	(2)	64.	(3)	65.	(1)	66.	(2)	67.	(2)	68.	(4)	69.	(1)	70.	(3)
71.	(1)	72.	(3)	73.	(2)	74.	(4)	75.	(2)	76.	(1)	77.	(2)	78.	(1)	79.	(3)	80.	(2)
81.	(1)	82.	(3)	83.	(3)	84.	(1)	85.	(1)	86.	(1)	87.	(4)	88.	(3)	89.	(2)	90.	(3)
91.	(1)	92.	(3)	93.	(3)	94.	(4)	95.	(2)	96.	(4)	97.	(3)	98.	(2)	99.	(1)	100.	(4)
101.	(1)	102.	(2)	103.	(2)	104.	(3)	105.	(2)	106.	(4)	107.	(3)	108.	(4)	109.	(3)	110.	(2)
111.	(4)	112.	(4)	113.	(3)	114.	(3)	115.	(1)	116.	(2)	117.	(4)	118.	(1)	119.	(4)	120.	(3)
121.	(4)	122.	(3)	123.	(2)	124.	(2)	125.	(2)	126.	(3)	127.	(1)	128.	(3)	129.	(1)	130.	(1)
131.	(4)	132.	(3)	133.	(4)	134.	(3)	135.	(3)	136.	(2)	137.	(4)	138.	(3)	139.	(3)	140.	(2)
141.	(2)	142.	(3)	143.	(3)	144.	(4)	145.	(3)	146.	(4)	147.	(2)	148.	(3)	149.	(1)	150.	(4)
151.	(1)	152.	(2)	153.	(4)	154.	(2)	155.	(1)	156.	(2)	157.	(4)	158.	(3)	159.	(3)	160.	(3)
161.	(2)	162.	(2)	163.	(2)	164.	(3)	165.	(2)	166.	(1)	167.	(4)	168.	(1)	169.	(3)	170.	(1)
171.	(4)	172.	(4)	173.	(1)	174.	(1)	175.	(3)	176.	(4)	177.	(4)	178.	(1)	179.	(2)	180.	(2)
181.	(3)	182.	(1)	183.	(3)	184.	(3)	185.	(3)	186.	(3)	187.	(1)	188.	(2)	189.	(2)	190.	(4)
191.	(3)	192.	(3)	193.	(2)	194.	(3)	195.	(3)	196.	(2)	197.	(1)	198.	(1)	199.	(4)	200.	(2)
201.	(4)	202.	(4)	203.	(4)	204.	(2)	205.	(3)	206.	(3)	207.	(1)	208.	(3)	209.	(3)	210.	(2)
211.	(1)	212.	(4)	213.	(4)	214.	(2)	215.	(1)	216.	(1)	217.	(2)	218.	(2)	219.	(3)	220.	(3)
221.	(1)	222.	(2)	223.	(2)	224.	(3)	225.	(4)	226.	(3)	227.	(1)						

INTRODUCTION

1 Evolutionary biology

I:	is the subfield of biology that studies the evolutionary processes (natural selection, common descent, speciation) that produced the diversity of life on Earth.
II:	is also defined as the study of the history of life forms on Earth.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

ORIGIN OF LIFE

2 Consider the given two statements:

Assertion:	When we look at stars on a clear night sky we are, in a way, looking back in time.
Reason:	When we see objects in our immediate surroundings, we see them instantly and hence in the present time.

1.	(A) is False but (R) is True
2.	(A) is True but (R) is False
3.	Both (A) and (R) are True and (R) is the correct explanation of (A)
4.	Both (A) and (R) are True but (R) is not the correct explanation of (A)

3 In the solar system of the milky-way galaxy, the earth was supposed to have been formed about:

1.	20 billion years back	2.	10 billion years back
3.	4.5 billion years back	4.	3.0 billion years back

4 Given the following statements about activities in the early earth:

I:	Water vapour, methane, carbon dioxide, and ammonia released from molten mass covered the surface.
II:	The UV rays from the sun broke up water into Hydrogen and Oxygen and the lighter H_2 escaped.
III:	Oxygen combined with ammonia and methane to form water, CO_2, and other gases.
IV:	As it cooled, the water vapour fell as rain, filling all the depressions and forming oceans.

Select the correct statements:

1. Only **I, II** and **III** are correct
2. Only **I, II** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. All are correct

5 Which theory, regarding the origin of life, is alternatively also called "panspermia"?

1.	Special Creation	2.	Spontaneous Generation
3.	Cosmozoan Theory	4.	Biochemical Evolution

6 The theory of spontaneous generation stated that:

1.	life arose from living forms only
2.	life can arise from both living and non-living
3.	life can arise from non-living things only
4.	life arises spontaneously, neither from the living nor from the non-living

7 Oparin of Russia and Haldane of England proposed that:

I:	The first form of life could have come from pre-existing non-living organic molecules (e.g. RNA, protein, etc.)
II:	The formation of life was preceded by chemical evolution, i.e., the formation of diverse organic molecules from inorganic constituents.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

8 For the stability of the organic compounds, Oparin opined that, probably:

1.	UV radiation never reached the surface of the primeval Earth
2.	the primeval Earth was in a molten state
3.	the primeval Earth atmosphere was reducing rather than oxidizing
4.	plenty of energy sources were available for chemical reactions to occur

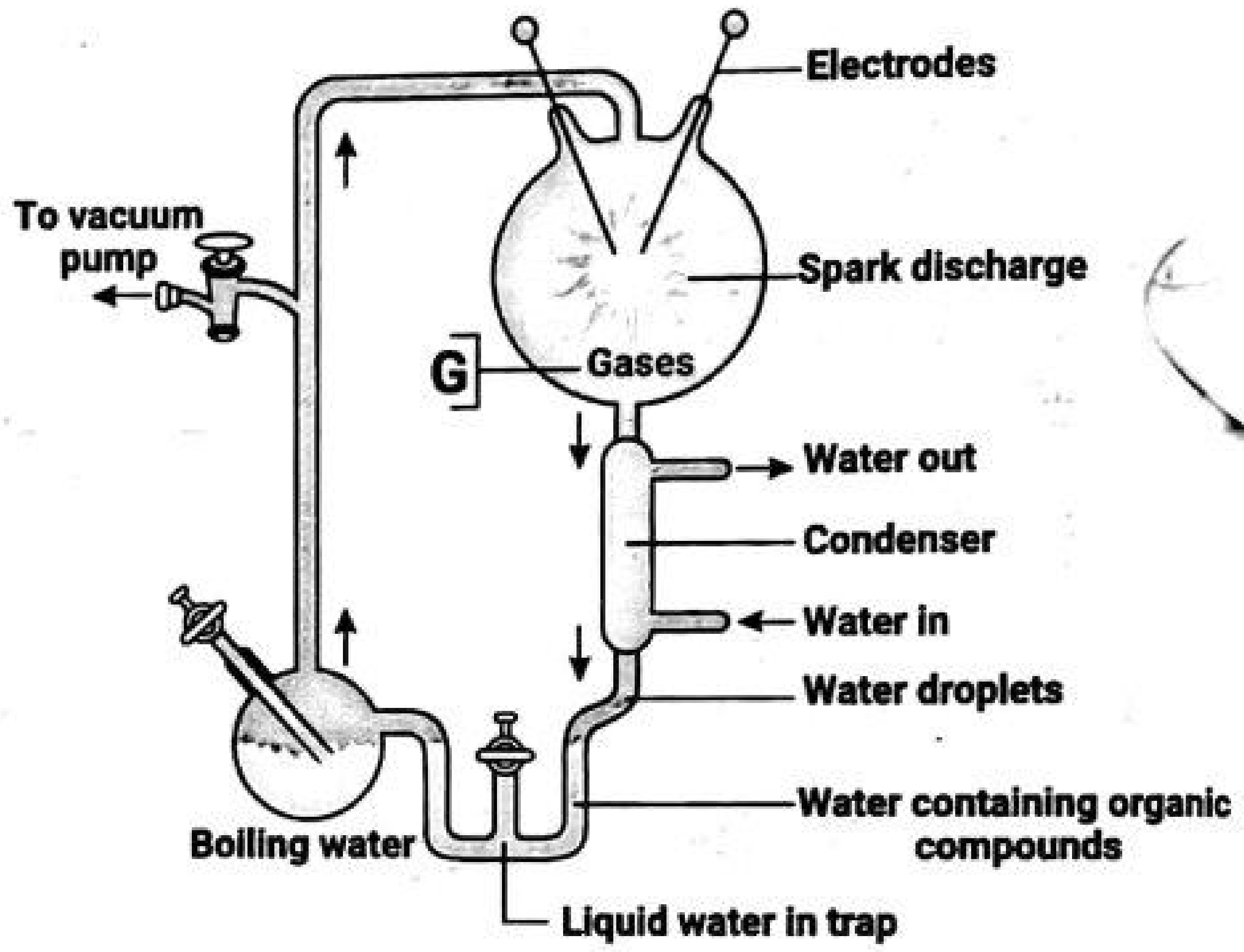
9 In 1953, S. L. Miller created primitive earth conditions in the laboratory and gave experimental evidence for the origin of the first form of life from pre-existing non-living organic molecules. The primitive earth conditions created include:

1.	low temperature, volcanic storms, an atmosphere rich in oxygen
2.	low temperature, volcanic storms, reducing atmosphere
3.	high temperature, volcanic storms, non-reducing atmosphere
4.	high temperature, volcanic storms, reducing atmosphere containing CH_4, NH_3 etc.

10 According to Oparin, which one of the following was not present in the primitive atmosphere of the earth?

1.	Oxygen	2.	Hydrogen
3.	Water vapour	4.	Methane

11 In the apparatus of the Urey and Miller experiment, the gases [G] contained in the flask are:



1.	Methane, Carbon dioxide, Ammonia, and Water vapour
2.	Methane, Hydrogen cyanide, Ammonia, and Water vapour
3.	Methane, Ammonia, Hydrogen, and Water vapour
4.	Carbon dioxide, Oxygen, Hydrogen, and Ammonia

12 Consider the given two statements:

Assertion (A):	Louis Pasteur, in his experiment, showed that in pre-sterilised flasks, life did not come from killed yeast while in another flask open to air, new living organisms arose from 'killed yeast'.
Reason (R):	Life comes only from pre-existing life.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
4.	**(A)** is False but **(R)** is True

EVOLUTION OF LIFE FORMS – A THEORY

13 The connotations of the special creation theory regarding the origin of life do not include:

1. All living organisms (species or types) that we see today were created as such.
2. The diversity was always the same since creation and will be the same in future also.
3. Earth is about 4000 years old.
4. Living organisms develop from non-living matter.

14 The connotations about the theory of special creation include:

I:	All living organisms (species or types) that we see today were created as such.
II:	Diversity was always the same since creation and will be the same in the future also.
III:	Earth is about 4 billion years old.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

15 Which of the following was not a conclusion drawn by Charles Darwin based on observations made during a sea voyage in a sailing ship called H.M.S. Beagle around the world?

1. Existing living forms share similarities to varying degrees not only among themselves but also with life forms that existed millions of years ago.
2. There had been extinctions of different life forms in the years gone by just as new forms of life arose at different periods of the history of the earth.
3. There has been a sudden and dramatic evolution of life forms.
4. Those characteristics which enable some to survive better in natural conditions (climate, food, physical factors, etc.) would outbreed others that are less endowed to survive under such natural conditions.

16 Name the naturalist who worked in the Malay Archipelago and had also come to conclusions similar to Darwin around the same time:

1.	Georges Cuvier	2.	Lyell
3.	Hugo de Vries	4.	Alfred Russell Wallace

17 Consider the given two statements:

Assertion(A):	The fitness, according to Darwin, refers ultimately and only to reproductive fitness.
Reason(R):	Those who are better fit in an environment, leave more progeny than others.

1. **(A)** is True but **(R)** is False
2. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
3. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
4. **(A)** is False but **(R)** is True

18 Which of the following statements accurately reflects a concept of Darwinism?

1. Variation among individuals of a species is due to use and disuse of organs.
2. Inheritance of acquired characteristics is the basis of evolution.
3. Natural selection is the mechanism by which the fittest individuals survive and reproduce, passing on their traits to the next generation.
4. All species on Earth are unchanging and have remained so since their creation.

WHAT ARE THE EVIDENCES FOR EVOLUTION?

19 Palaeontological evidence for evolution refers to the:

1.	development of the embryo	2.	homologous organs
3.	fossils	4.	analogous organs

20 Fossils are generally found in:

1.	Sedimentary rocks	2.	Igneous rocks
3.	Metamorphic rocks	4.	Any type of rock

21 A study of fossils in different sedimentary layers:

I:	indicates the geological period in which they existed.
II:	shows that life-forms varied over time.
III:	shows that certain life-forms are restricted to certain geological time-spans.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

22 Consider the given two statements:

Assertion (A):	Fossils are generally found in sedimentary rocks.
Reason (R):	For fossilization, the organism must become covered by sediment soon after death, otherwise the remains are destroyed by scavengers or decomposition.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	**(A)** is False but **(R)** is True.

23 Consider the given two statements:

Assertion(A):	Geologists use radioactive dating to estimate how long ago rocks were formed, and to infer the ages of fossils contained within those rocks.
Reason(R):	Radioactive atoms are trapped inside the rocks when they are formed and afterwards, they decay at a predictable rate.

1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

24 Consider the given two statements:

Assertion (A):	Only a small percentage of life-forms can be expected to be represented in fossil discoveries.
Reason (R):	Organisms are only rarely preserved as fossils in the best of circumstances, and only a fraction of such fossils have been discovered.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

25 "Organisms that share common descent show underlying embryological patterns on which they build later their adult patterns". This is :

1.	Haeckel's law	2.	Baer's law
3.	Gauss law	4.	Allen's rule

26 Consider the given two statements:

Assertion(A):	Ernst Haeckel's proposal for embryological support for evolution was disapproved by Karl Ernst von Baer.
Reason(R):	Karl Ernst von Baer noted that embryos pass through the adult stages of other animals.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

27 Similar biological structures or sequences in different taxa are homologous if they:

1.	always perform the same function
2.	result from convergent evolution
3.	do not serve any known function
4.	are derived from a common ancestor

28 A thorn of *Bougainvillea* and a tendril of *Cucurbita* are an example of :

1.	analogous organs	2.	vestigial organs
3.	homologous organs	4.	defense organs

29 The wings of birds, the forelegs of a horse, and the upper limbs of humans are:

1.	analogous structures	2.	homologous structures
3.	vestigial structures	4.	phylogenetic structures

30 The wings of an insect and the wings of a bird are examples of:

1.	analogous structures	2.	homologous structures
3.	vestigial structures	4.	phylogenetic structures

31 Consider the given two statements:

Assertion(A):	Similarities in proteins and genes performing a given function among diverse organisms give clues to common ancestry.
Reason(R):	In general, the more DNA differences in homologous genes (or amino acid differences in the proteins they encode) between two species, the more closely the species are related and they share a more recent ancestor.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

32 Consider the given two statements:

Assertion(A):	Homology implies divergent evolution.
Reason(R):	Homologous organs are organs which do similar jobs in two taxa that were not present in their most recent common ancestor but rather evolved separately.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

33 Consider the given two statements:

Statement I:	Homologous organs perform different functions but have similar origins.
Statement II:	Analogous organs perform similar functions but have different origins.

1.	**Statement I** is True but **Statement II** is False.
2.	**Statement I** is False but **Statement II** is True.
3.	Both **Statements** are True.
4.	Both **statements** are False.

34 Analogous organs arise due to:

1.	divergent evolution	2.	artificial selection
3.	genetic drift	4.	convergent evolution

35 Consider the following statements:

I:	The thorns and tendrils of *Bougainvillea* and *Cucurbita* represent homology.
II:	Sweet potato and potato exhibit analogy.
III:	Homologous organs are the result of divergent evolution & analogous organs are the result of convergent evolution.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

36 Consider the given two statements:

Statement I:	The eye of the octopus and of mammals is an example of an analogy.
Statement II:	Analogous organs are results of convergent evolution.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

37 All the following are examples of analogous organs except:

1.	Thorn and tendrils of *Bougainvillea* and *Cucurbita*
2.	Sweet potato and Potato
3.	Flippers of Penguins and Dolphins
4.	Eye of the *Octopus* and of Mammals

38 Plica semilunaris on the inside corner of the eye and, muscles in the pinna are:

1.	analogous structures	2.	homologous structures
3.	vestigial structures	4.	phylogenetic structures

39 Consider the given two statements:

Assertion(A):	Vestigial structures can be considered evidence for evolution.
Reason(R):	Vestigial structures are often homologous to structures that are functioning normally in other species.

1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

40 If you observe the embryos of reptiles, birds, and mammals during their early stages of development, they look very similar. The correct inference from this observation will be that reptiles, birds, and mammals:

1.	have a common ancestor
2.	live in the same types of environments
3.	are no longer undergoing evolution
4.	have gotten rid of all their vestigial structures

41 Which of the following pairs of organs do not represent analogous organs?

1.	Eye of an octopus and the eye of a mammal
2.	Flippers of penguins and flippers of dolphin
3.	Wings of bats and forelimbs of humans
4.	Wings of birds and wings of butterfly

42 What will not be true regarding 'industrial melanism'?

1.	Before industrialisation set in in England, it was observed that there were more white-winged moths on trees than dark-winged or melanised moths.
2.	After industrialisation, there were more dark-winged moths in the same area.
3.	In areas where industrialisation did not occur e.g. in rural areas, the count of melanic moths was low.
4.	One of two variants got completely wiped out according to prevalent conditions and later arose through a recurring mutation.

43 Which type of selection explains industrial melanism observed in moth, *Biston betularia*?

1.	Stabilising	2.	Directional
3.	Disruptive	4.	Artificial

44 Industrial melanism is an excellent example of 'evolution in action' where the selecting agent is:

1.	humans	2.	toxins from smoke
3.	birds	4.	tree bark

45 Industrial melanism is an example of:

1.	Natural selection	2.	Mutation
3.	Racial difference	4.	Predation

46 Consider the given two statements:

Assertion(A):	In England, before industrialisation set in, it was observed that there were more white-winged moths on trees than dark-winged or melanised moths.
Reason(R):	Melanic form arose from a mutation only after the onset of industrial revolution.

1. **(A)** is True but **(R)** is False
2. **(A)** is False but **(R)** is True
3. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

47 Industrial melanism is a phenomenon that best demonstrates:

1. The overuse of industrial pollutants leading to genetic mutations in species.
2. The ability of a species to change color in response to industrial pollution.
3. Evolution through natural selection, where darker individuals become more common due to industrial pollution.
4. The disappearance of industrial pollutants from the environment due to the adaptation of microorganisms.

48 All the following are examples of evolution by anthropogenic action except:

1. Industrial melanism seen in peppered moth
2. Pesticide resistance in pests
3. Emergence of antibiotic resistant bacteria
4. Streamlined body in dolphins

49 Consider the given two statements:

Assertion (A):	Evolution is a stochastic process.
Reason(R) :	Evolution is based on chance events in nature and chance mutation in the organisms.

1. **(A)** is True but **(R)** is False
2. **(A)** is False but **(R)** is True
3. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
4. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**

WHAT IS ADAPTIVE RADIATION?

50 Consider the given two statements:

Assertion(A):	Darwin's finches represent one of the best examples of adaptive radiation.
Reason(R):	Darwin's finches are derived from a single ancestor that arrived in the Galapagos from mainland South America.

1. **(A)** is True but **(R)** is False
2. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
3. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
4. **(A)** is False but **(R)** is True

51 Adaptive radiation refers to:

1. The gradual loss of species as they fail to adapt to new environmental conditions.
2. The process where organisms evolve from a common ancestor to fill a variety of different niches.
3. The radiation from the sun leading to mutations and hence the evolution of new species.
4. The spread of a single species into different forms that inhibit different niches.

52 Diversification from an ancestral species, in response to the opening of new habitats leading to formation of new species, is:

1.	parallelism	2.	natural selection
3.	catastrophism	4.	adaptive radiation

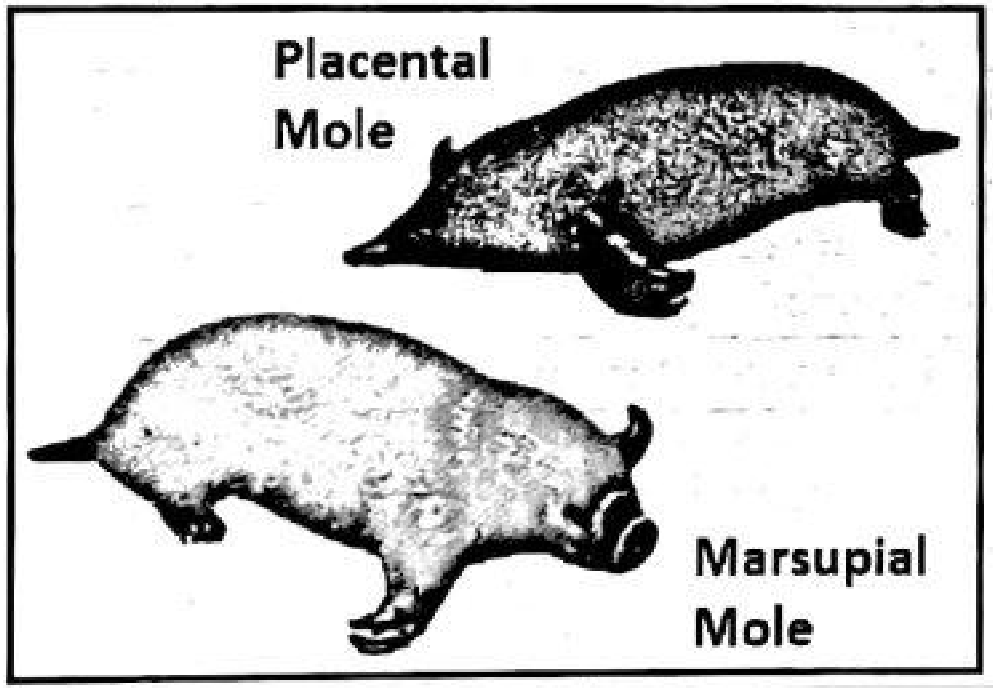
53 Some of the marsupials of Australia resemble equivalent placental mammals that live in similar habitats on other continents. This is an example of:

1.	Convergent evolution	2.	Divergent evolution
3.	Saltatory evolution	4.	Adaptive radiation

54 Within the Australian continent marsupials have undergone:

1.	disruptive selection
2.	adaptive radiation
3.	extinction
4.	rapid speciation due to sudden large scale mutations

55 The similarity between marsupial mole and placental mole as shown in the given figure is due to:



1.	saltation	2.	molecular clocks
3.	punctuated equilibrium	4.	convergent evolution

56 Which of the following best describes the finches of the Galápagos Islands in the context of adaptive radiation?

1.	They are an example of convergent evolution.
2.	They exhibit variations in beak size and shape due to adaptation to different food sources.
3.	They all have the same diet and habitat.
4.	They evolved into similar forms as a result of similar environmental pressures.

57 Consider the given two statements:

Statement I:	Adaptive radiation within different isolated environments (such as separate lakes) can lead to convergent evolution when species independently evolve similar traits to adapt to similar ecological niches.
Statement II:	This convergence occurs despite the species having different evolutionary histories, highlighting how similar environmental challenges can shape similar evolutionary outcomes.

1. Only **Statement I** is correct
2. Only **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Both **Statement I** and **Statement II** are incorrect

BIOLOGICAL EVOLUTION

58 Evolution by natural selection, in a true sense, would have started when:

1.	The big bang led to the formation of galaxies
2.	The Earth was formed around 4 billion years ago
3.	Cellular forms of life with differences in metabolic capability originated on earth
4.	Life moved to land from water.

59 The essence of Darwinian theory about evolution is natural selection. What would be true?

I:	Nature selects for fitness.
II:	Fitness is based on characteristics that are inherited.
III:	Fitness is the end result of the ability to adapt and get selected by nature.

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

60 The two key concepts of the Darwinian Theory of Evolution are:

1.	Branching descent and natural selection
2.	Saltation and Catastrophism
3.	Use and disuse of organs and inheritance of acquired traits
4.	Reproductive isolation and Founder effect

EVOLUTION

61 Consider the following statements:

I:	Nature selects for fitness.
II:	Fitness is based on characteristics that are inherited.
III:	Fitness is the end result of the ability to adapt and get selected by nature.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I**, **II**, and **III**

62 It is possible that Darwin was influenced by the essay on populations by:

1.	Carl Correns	2.	Charles Lyell
3.	Thomas Malthus	4.	A. R. Wallace

63 "Giraffes, in an attempt to forage leaves on tall trees, had to adapt by elongation of their necks and they passed on this acquired character of elongated neck to succeeding generations" – this explanation of long necks can best be ascribed to:

1.	Charles Darwin	2.	Lamarck
3.	Hugo de Vries	4.	Louis Pasteur

64 Consider the given observation of Darwin and the inference drawn by him while developing his idea about the mechanism of evolution:

Observation:	Natural resources are limited, populations are stable in size except for seasonal fluctuation, members of a population vary in characteristics even though they look superficially similar, and most variations are inherited.
Inference:	There had been competition for resources and variations, which are heritable and which make resource utilisation better for few (adapted to habitat better) will enable only those to reproduce and leave more progeny.

1.	Both Observation and Inference are correct but Inference does not explain the Observation.
2.	Both Observation and Inference drawn are incorrect.
3.	Observation is incorrect and the Inference drawn is correct.
4.	Observation is correct and the Inference drawn is correct.

65 For natural selection to bring about evolution, the trait selected by the nature must be:

1.	Dominant	2.	Recessive
3.	Mutant	4.	Inherited

66 How many of the given statements regarding gradual evolution of life forms as explained by Darwin are correct?

I:	Any population has built in variation in characteristics.
II:	Those characteristics which enable some to survive better in natural conditions (climate, food, physical factors, etc.) would outbreed others that are less-endowed to survive under such natural conditions.
III:	The fitness, according to Darwin, refers ultimately and only to reproductive fitness.
IV:	Those who are better fit in an environment, leave more progeny than others.

1. 1
2. 2
3. 3
4. 4

67 Consider the given two statements:

Assertion (A):	Variations on which natural selection acts, arise as a result of random mutations.
Reason (R):	A new variation may, or may not, be adaptive.

1.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	**(A)** is False and **(R)** is also False.
4.	**(A)** is True but **(R)** is False.

68 Consider the given two statements:

Assertion (A):	Evolution by natural selection works best on a population having no variation.
Reason (R):	A population having no variation always reproduces exponentially.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True but **(R)** is False.
4. Both **(A)** and **(R)** are False.

69 Natural selection is:

1. The process by which traits are inherited through acquired characteristics.
2. The differential survival and reproduction of individuals due to differences in phenotype.
3. The random distribution of alleles during gamete formation.
4. The migration of individuals between populations leading to gene flow.

MECHANISM OF EVOLUTION

70 Hugo de Vries based on his work on evening primrose brought forth the idea of:

1. continuous variations
2. mutations
3. genetic drift
4. genetic death

71 Identify the correct statement:

1. Both Hugo de Vries and Darwin believed that it was mutation that caused evolution.
2. Both Hugo de Vries and Darwin believed that it was minor variations that caused evolution, not mutation.
3. Mutations are small and directional, while Darwinian variations are random and directionless.
4. Evolution for Darwin was gradual while de Vries believed mutation caused speciation and hence called it saltation (single-step large mutation).

72 Hugo de Vries believed that:

1. discontinuous variations due to mutations are important for evolution
2. continuous variations due to recombination are important for evolution
3. evolution is a function of time
4. evolution is a deterministic process

73 The ultimate source of genetic variability in the gene pool of a population is:

1. mutation
2. migration
3. genetic drift
4. non-random mating

74 Saltation is a mechanism of evolution that involves:

1. Rapid changes due to a single mutation
2. Gradual changes accumulating over long periods
3. Changes in allele frequency due to genetic drift
4. Changes due to gene flow between populations

HARDY WEINBERG PRINCIPLE

75 What is genetic equilibrium?

1. When all the alleles of a gene are present in a population in equal frequencies
2. When the number of heterozygotes in a population is equal to the number of either of the homozygote.
3. When the number of heterozygotes in a population is equal to the number of either of the homozygote.
4. When the frequency of particular genes or alleles remains constant in a population through generations

76 Disturbance in genetic equilibrium, or Hardy-Weinberg equilibrium, is interpreted as resulting in:

1. adaptive radiation
2. evolution
3. saltation
4. speciation

EVOLUTION

77 The frequency of an allele in a population is ultimately decided by:

1.	Dominance
2.	Whether it is autosomal linked or sex linked
3.	Forces such as natural selection
4.	The number of alleles present for a particular gene

78 According to the Hardy-Weinberg equilibrium, which condition is not required for a population to remain at genetic equilibrium?

1.	Random mating must occur.
2.	The population must be infinitely large.
3.	Migration must occur frequently with other populations.
4.	There should be no selection for any of the genotypes.

79 Five factors are known to affect Hardy-Weinberg equilibrium. Which of the following is not one of them?

1. gene migration or gene flow
2. genetic drift
3. mutation
4. random mating

80 In a population of certain plants in a given area, the frequency of the allele for red flowers was 0.8. [Red color is the dominant trait and white color is the recessive trait and there are only two alleles for flower color]. What will be the frequency of the white allele in this population?

1. 0.8
2. 0.32
3. 0.16
4. 0.2

81 In the Hardy-Weinberg equation, what does the term '2pq' represent?

1. the frequency of dominant homozygotes
2. the frequency of recessive homozygotes
3. the frequency of dominant allele
4. the frequency of heterozygotes

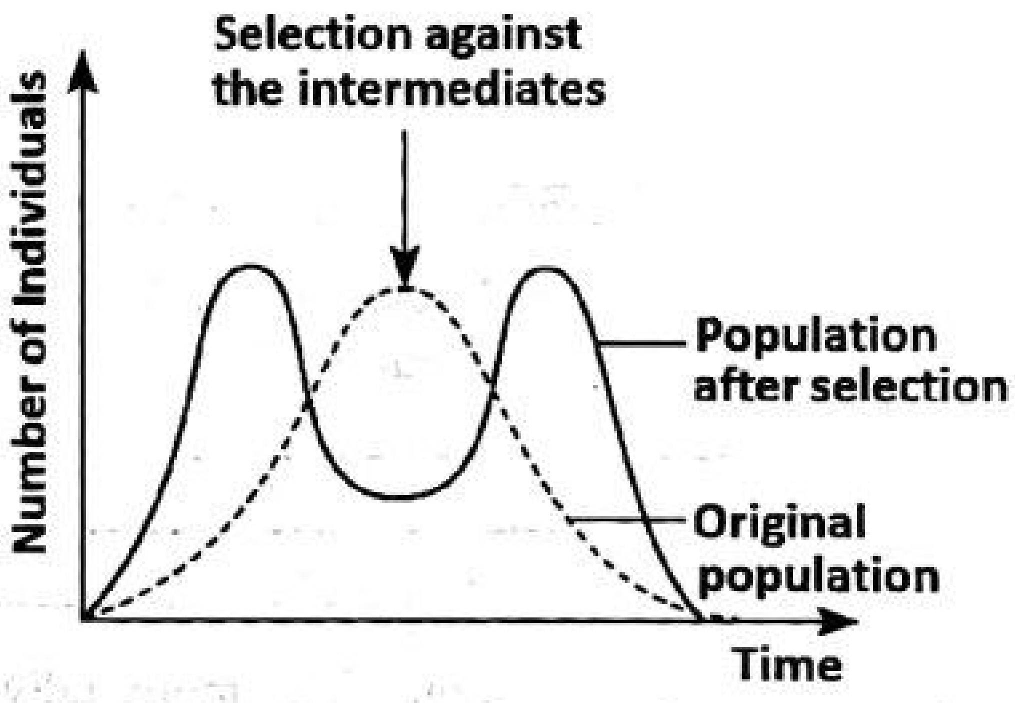
82 What evolutionary agent describes the movement of new genes into a population as a result of migration or hybridization?

1. founder principle
2. gene flow
3. bottleneck effect
4. adaptation

83 The loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population is called as:

1.	Gene flow	2.	Bottleneck effect
3.	Founder effect	4.	Genetic death

84 What type of natural selection is shown in the given figure?



1. Stabilising
2. Directional
3. Disruptive
4. Reverse

85 If the frequency of the dominant allele (A) in a population is 0.5, what is the frequency of the heterozygotes [Aa] if the population is in genetic equilibrium?

1.	0.5	2.	0.25
3.	0.75	4.	0.125

86 What does the 'founder effect' describe?

1.	The impact of new mutations in a small population.
2.	The effect of a dominant individual founding a new population.
3.	The loss of genetic variation when a new colony is formed by a very small number of individuals from a larger population.
4.	The influence of a new environment on a small population.

87 The frequency of recessive allele in a population of 500 at genetic equilibrium was found to be 0.4. What would be the number of heterozygotes in this population?

1. 40
2. 240
3. 200
4. 320

88 For the MN-blood group system, the frequencies of M and N alleles are 0.7 and 0.3, respectively. The expected frequency of MN-blood group bearing organisms is likely to be

1.	42%	2.	49%
3.	9%	4.	58%

89 The type of natural selection where more individuals acquire value other than the mean character value is regarded as:

1. Stabilizing
2. Directional
3. Disruptive
4. Reverse

90 Which of the following statements regarding genetic drift is true?

1.	Genetic drift results from differential reproductive success.
2.	Genetic drift has a greater effect in large populations.
3.	Genetic drift tends to increase genetic variation within a population.
4.	Genetic drift is usually based on a random chance event.

91 Why is the frequency of the allele for sickle cell anemia high in certain populations in Africa?

1.	gene therapy has alleviated the condition
2.	the disease is carried on a dominant allele
3.	individuals with one allele for sickle-cell anemia are resistant to malaria
4.	the mutation rates are high in humans in African continent

92 Majority of human newborns weigh around 7 pounds. What type of natural selection might be operative here?

1. directional
2. stabilizing
3. disruptive
4. reverse

A BRIEF ACCOUNT OF EVOLUTION

93 Invertebrates were formed and were active by the time of:

1.	200 mya	2.	300 mya
3.	400 mya	4.	500 mya

94 Jawless fishes probably evolved around:

1.	500 mya	2.	350 mya
3.	320 mya	4.	300 mya

95 Seaweeds existed probably around:

1.	500 mya	2.	350 mya
3.	320 mya	4.	300 mya

96 Fishes with stout and strong fins that could move on land and go back to water existed about:

1.	500 mya	2.	350 mya
3.	320 mya	4.	300 mya

97 The connecting link between the fishes and amphibians is the:

1.	*Seymouria*	2.	*Peripatus*
3.	Cartilaginous fishes	4.	Coelocanths [lobe-finned fishes]

98 The mammals evolved from:

1.	Therapsids	2.	Prosimians
3.	Platyrrhinis	4.	Sauropsids

99 The extinct reptilian lineage that evolved into dinosaurs and later on the birds is:

1.	*Pelycosaurs*	2.	Synapsids
3.	Tuataras	4.	Thecodonts

100 Dinosaurs became extinct during the geological period:

1.	Carboniferous	2.	Jurassic
3.	Cretaceous	4.	Tertiary

101 Around 200 mya, some land reptiles went back to the water to evolve into fish-like reptiles, for example:

1.	*Pareiasaurus*	2.	*Pelycosaur*
3.	*Ichthyosaurus*	4.	*Archosaurus*

102 The dinosaurs suddenly disappeared about:

1.	50 mya	2.	65 mya
3.	75 mya	4.	90 mya

103 Though we cannot be certain, what can be the probable reason/s for the sudden disappearance of dinosaurs from the Earth?

I:	Climatic changes killed them
II:	Most of them evolved into birds

1.	**I** only	2.	**II** only
3.	Both **I** and **II**	4.	Neither **I** nor **II**

104 During which period of the geological time scale did the first seed plants evolve?

1.	Carboniferous	2.	Triassic
3.	Jurassic	4.	Cretaceous

105 The dominant plants during the Jurassic period were:

1.	Bryophytes and Ferns	2.	Gymnosperms
3.	Monocots	4.	Dicots

106 During which period of the geological time scale did the angiosperms evolve?

1.	Carboniferous	2.	Jurassic
3.	Cretaceous	4.	Tertiary

107 Bryophytes evolved from:

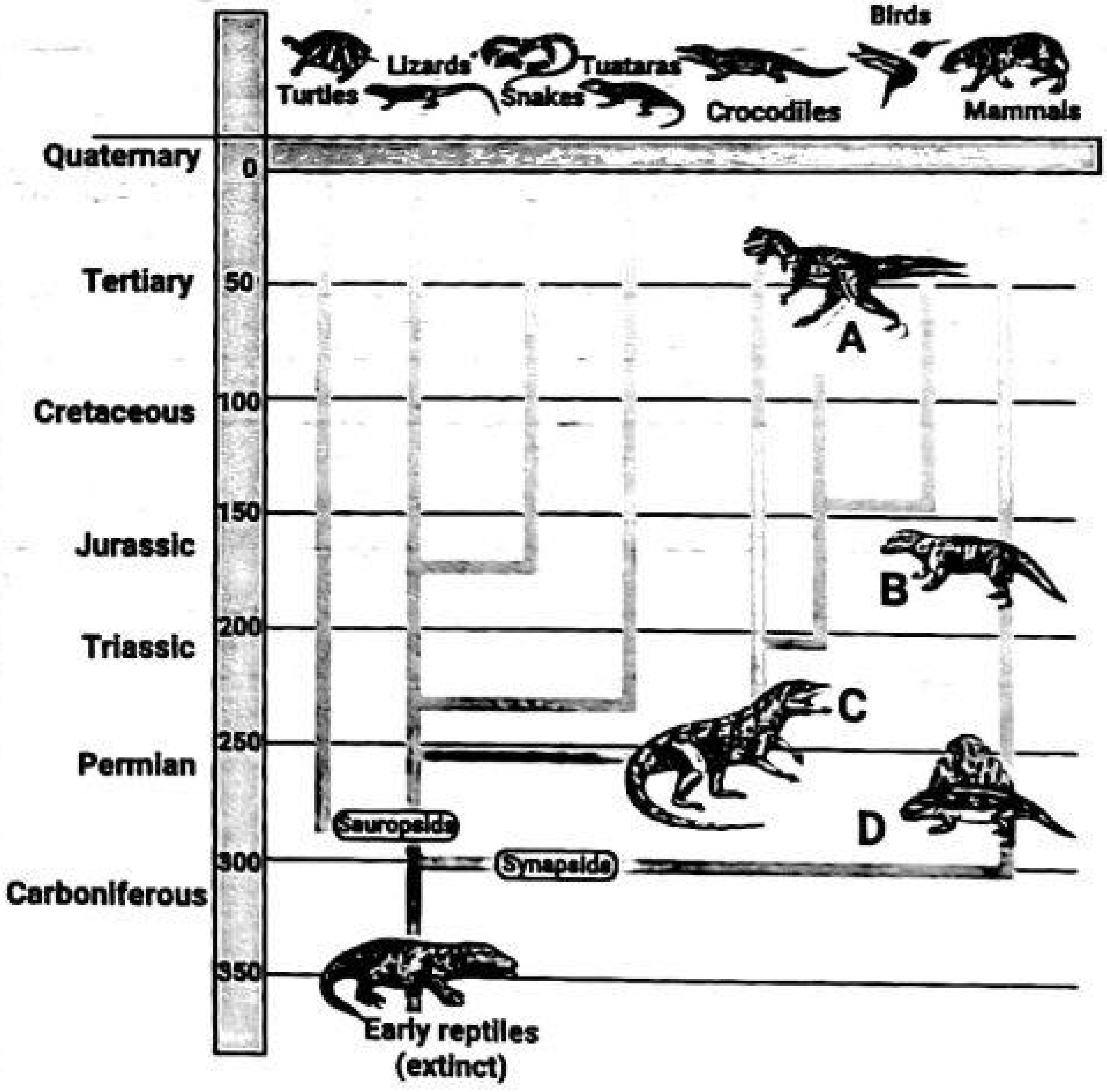
1.	Chlorophyte ancestors	2.	Tracheophyte ancestors
3.	Rhynia-type plants	4.	Psilophytons

108 Consider the given two statements:

Assertion(A):	Pouched mammals survived in the continent of Australia.
Reason(R):	Due to continental drift, pouched mammals of Australia did not face competition from any other mammals.

1.	**(A)** is false but **(R)** is true
2.	**(A)** is true but **(R)** is false
3.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**
4.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**

109 Given below is the representative evolutionary history of vertebrates through geological periods. A, B, C, and D, respectively, are:


Birds
Turtles
Lizards
Snakes
Tuataras
Crocodiles
Mammals
Quaternary
0
Tertiary
50
A
Cretaceous
100
150
Jurassic
B
Triassic
200
C
Permian
250
D
Sauropsids
300
Synapsids
Carboniferous
350
Early reptiles (extinct)

1.	Dinosaurs, Thecodonts, Therapsids, and Pelycousurs
2.	Dinosaurs, Therapsids, Thecodonts, and Pelycosaurs
3.	Pelycosaurs, Therapsids, Thecodonts, and Dinosaurs
4.	Theraosids, Dinosaurs, Pelycosaurs, and Thecodonts

110 In geological time scale, the correct sequence of periods [beginning with earliest] will be:

1.	Silurian → Devonian → Carboniferous → Permian
2.	Permian → Devonian → Carboniferous → Silurian
3.	Silurian → Carboniferous → Devonian → Permian
4.	Permian → Carboniferous → Devonian → Silurian

ORIGIN AND EVOLUTION OF MAN

111 The primates, *Dryopithecus* and *Ramapithecus*, existed around:

1.	15 mya	2.	20 mya
3.	25 mya	4.	30 mya

112 Two mya, *Australopithecines* probably lived in:

1.	Western Africa	2.	Eastern African grasslands
3.	South America	4.	South East Asia

113 The first human-like being, the hominid, was called:

1.	*Homo habilis*	2.	*Homo erectus*
3.	*Homo ergaster*	4.	*Homo neanderthelensis*

114 The fossils of *Homo erectus* were discovered in ______ and it existed about _____ mya.

1.	Tanzania; 2	2.	Java; 1.5
3.	Ethiopia; 1.5	4.	Australia; 2

115 The cranial capacity of *Homo erectus* was around:

1.	450 cc	2.	700 cc
3.	900 cc	4.	1000 cc

116 Identify the incorrect fact regarding the Neanderthal man:

1.	Cranial capacity of around 1400 cc
2.	Lived in East and Central Africa
3.	Used hides to protect their bodies
4.	Buried their dead

117 Identify the incorrect statement:

1.	Neanderthals lived between 1,50,000 and 1,00,000 years back.
2.	Modern *Homo sapiens* arose between 75000 and 10000 years ago.
3.	Pre-historic cave art developed around 18000 years ago.
4.	Agriculture came around 10000 years ago

118 A Hominid fossil discovered in Java in 1891, now extinct, having a cranial capacity of about 900 cc was:

1.	*Homo erectus*	2.	Neanderthal man
3.	*Homo sapiens*	4.	Australopithecus

119 The most accepted line of descent in human evolution is:

1.	Australopithecus → *Ramapithecus* → *Homo sapiens* → *Homo habilis*
2.	*Homo erectus* → *Homo habilis* → *Homo sapiens*
3.	*Ramapithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*
4.	Australopithecus → *Ramapithecus* → *Homo erectus* → *Homo habilis* → *Homo sapiens*.

120 The number of correct statements from the given statements is:

I:	*Ramapithecus* was more man-like, while *Dryopithecus* was more ape-like.
II:	*Homo habilis* had a brain capacity between 650-800cc.
III:	*Homo erectus* probably did not eat meat.
IV:	Agriculture came around 10,000 years ago, and human settlements started.

1. 1
2. 2
3. 3
4. 4

121 What is the main difference between Ramapithecus and Dryopithecus?

1. Ramapithecus is considered more closely related to modern humans than Dryopithecus.
2. Dryopithecus is an ancestor of gorillas, while Ramapithecus is an ancestor of orangutans.
3. Ramapithecus lived in Africa, while Dryopithecus lived in Asia.
4. Dryopithecus is more closely related to modern humans than Ramapithecus.

122 Consider the given two statements:

I: *Dryopithecus* was more man-like, and *Ramapithecus* was more ape-like.

II: *Homo habilis* probably did not eat meat, while *Homo erectus* probably ate meat.

1. Only **I** is correct.
2. Only **II** is correct.
3. Both **I** and **II** are correct.
4. Both **I** and **II** are incorrect.

123 According to the fossil record and evidence from comparative anatomy, which of the following statements about human evolution is most likely true?

1. Modern humans (Homo sapiens) evolved directly from Australopithecus without any intermediate species.
2. Neanderthals and Homo sapiens likely co-existed for some time before the extinction of Neanderthals.
3. The evolution of bipedalism (walking upright) was a defining characteristic of the earliest hominid ancestors.
4. The increase in brain size is a consistent trend observed throughout human evolution.

124 The Neanderthal man was characterized by:

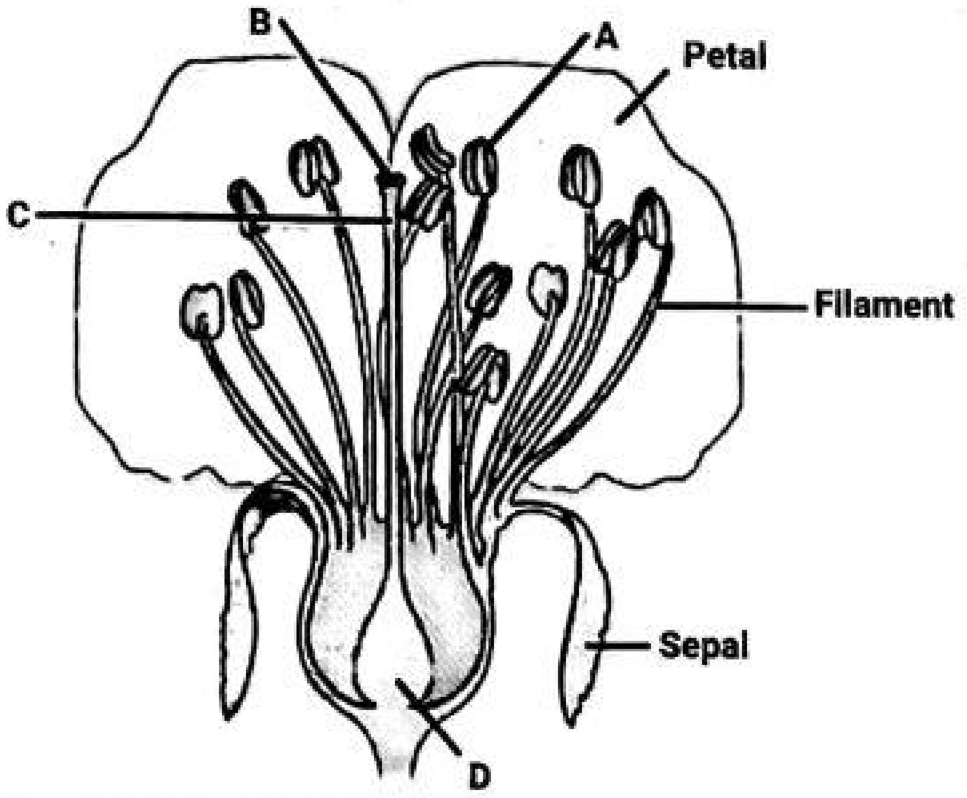
1. A brain capacity larger than that of modern humans.
2. The use of sophisticated tools and the development of language.
3. Erect posture and a brain capacity smaller than that of modern humans.
4. A nomadic lifestyle with the use of simple stone tools.

EVOLUTION - ANSWER KEY

1.	(3)	2.	(4)	3.	(3)	4.	(4)	5.	(3)	6.	(3)	7.	(3)	8.	(3)	9.	(4)	10.	(1)
11.	(3)	12.	(2)	13.	(4)	14.	(1)	15.	(3)	16.	(4)	17.	(2)	18.	(3)	19.	(3)	20.	(1)
21.	(4)	22.	(3)	23.	(2)	24.	(1)	25.	(2)	26.	(3)	27.	(4)	28.	(3)	29.	(2)	30.	(1)
31.	(3)	32.	(3)	33.	(3)	34.	(4)	35.	(4)	36.	(1)	37.	(1)	38.	(3)	39.	(2)	40.	(1)
41.	(3)	42.	(4)	43.	(2)	44.	(3)	45.	(1)	46.	(1)	47.	(3)	48.	(4)	49.	(3)	50.	(2)
51.	(2)	52.	(4)	53.	(1)	54.	(2)	55.	(4)	56.	(2)	57.	(3)	58.	(3)	59.	(4)	60.	(1)
61.	(4)	62.	(3)	63.	(2)	64.	(4)	65.	(4)	66.	(4)	67.	(1)	68.	(4)	69.	(2)	70.	(2)
71.	(4)	72.	(1)	73.	(1)	74.	(1)	75.	(4)	76.	(2)	77.	(3)	78.	(3)	79.	(4)	80.	(4)
81.	(4)	82.	(2)	83.	(3)	84.	(3)	85.	(1)	86.	(3)	87.	(2)	88.	(1)	89.	(2)	90.	(4)
91.	(3)	92.	(2)	93.	(4)	94.	(2)	95.	(3)	96.	(2)	97.	(4)	98.	(1)	99.	(4)	100.	(3)
101.	(3)	102.	(2)	103.	(3)	104.	(1)	105.	(2)	106.	(3)	107.	(1)	108.	(3)	109.	(2)	110.	(1)
111.	(1)	112.	(2)	113.	(1)	114.	(2)	115.	(3)	116.	(2)	117.	(1)	118.	(1)	119.	(3)	120.	(3)
121.	(1)	122.	(2)	123.	(2)	124.	(1)												

SEXUAL REPRODUCTION IN FLOWERING PLANTS

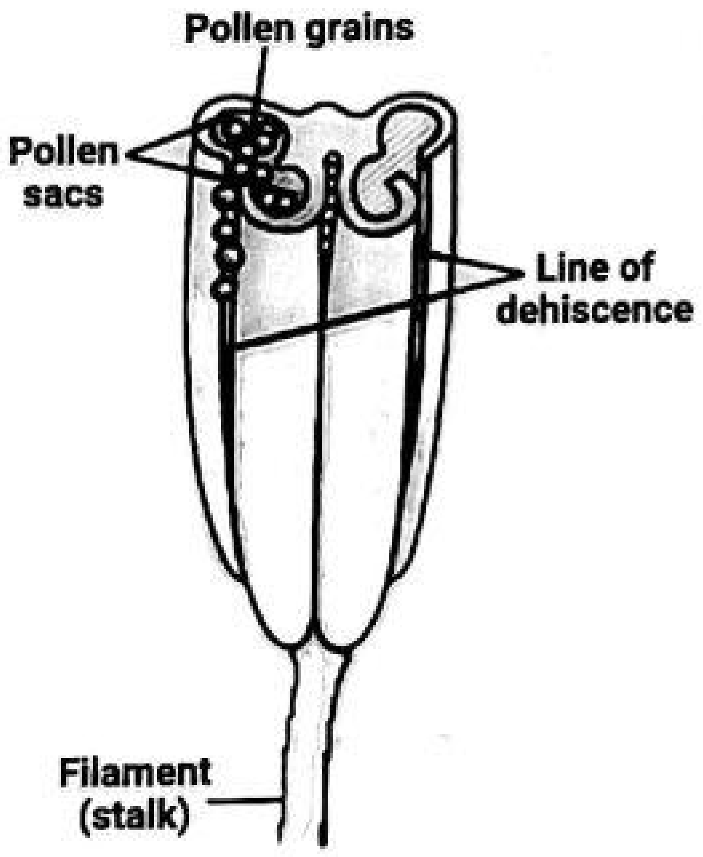
1 In the diagrammatic representation of L.S. of a flower:



Statement I:	A is anther and collectively anthers form the androecium of the flower.
Statement II:	B is the site for landing of pollens during pollination, C is style, and D after fertilisation becomes a fruit.

1.	Statement I is correct, Statement II is correct
2.	Statement I is incorrect, Statement II is correct
3.	Statement I is correct, Statement II is incorrect
4.	Statement I is incorrect, Statement II is incorrect

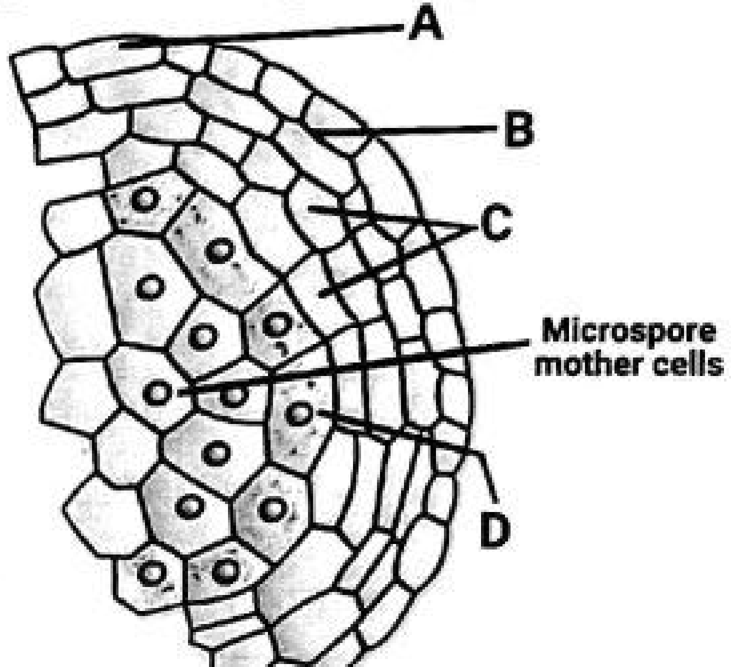
2 Given below is a three-dimensional cut section of an anther:



Statement I:	The bilobed nature of an anther is very distinct in the given section.
Statement II:	The anther is a two-sided [bigonal] structure consisting of four microsporangia located at the corners, two in each lobe.

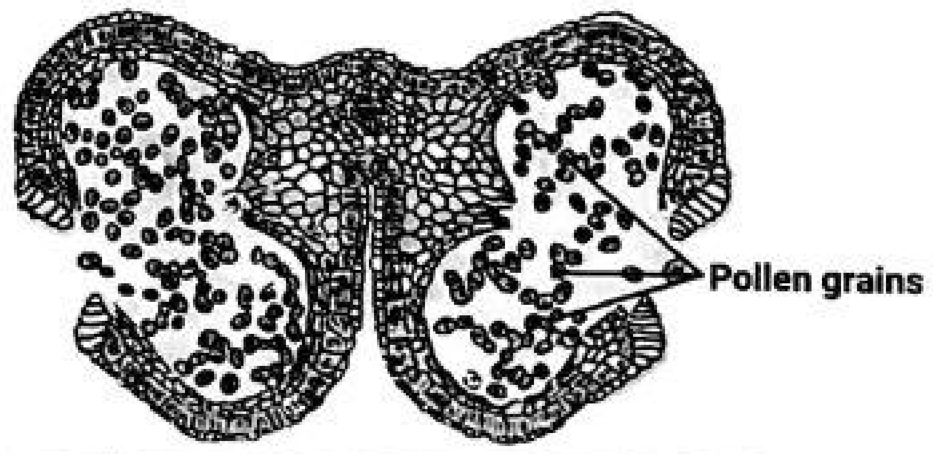
1.	Statement I is correct, Statement II is correct.
2.	Statement I is incorrect, Statement II is correct.
3.	Statement I is correct, Statement II is incorrect.
4.	Statement I is incorrect, Statement II is incorrect.

3 Identify A-D in the given enlarged view of one microsporangium showing wall layers:



	A	B	C	D
1.	Epidermis	Endothecium	Middle layers	Tapetum
2.	Epithelium	Endothelium	Middle layers	Tapetum
3.	Endothecium	Epidermis	Tapetum	Middle layers
4.	Epithelium	Endothelium	Tapetum	Middle layers

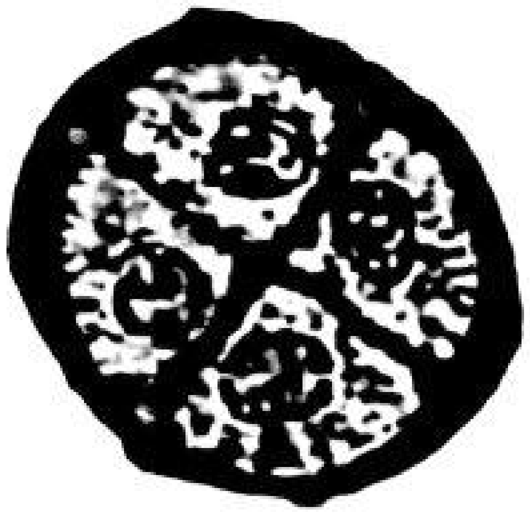
4 The given diagram shows a mature dehisced anther.



Statement I:	This process is coordinated precisely with pollen differentiation, floral development, and flower opening.
Statement II:	Anther dehiscence is the final function of the anther that causes the release of pollen grains.

1.	Both **Statement I** and **Statement II** are True and **Statement II** is the correct explanation of **Statement I**.
2.	Both **Statement I** and **Statement II** are True but **Statement II** is not the correct explanation of **Statement I**.
3.	**Statement I** is True but **Statement II** is False.
4.	**Statement I** is False but **Statement II** is True.

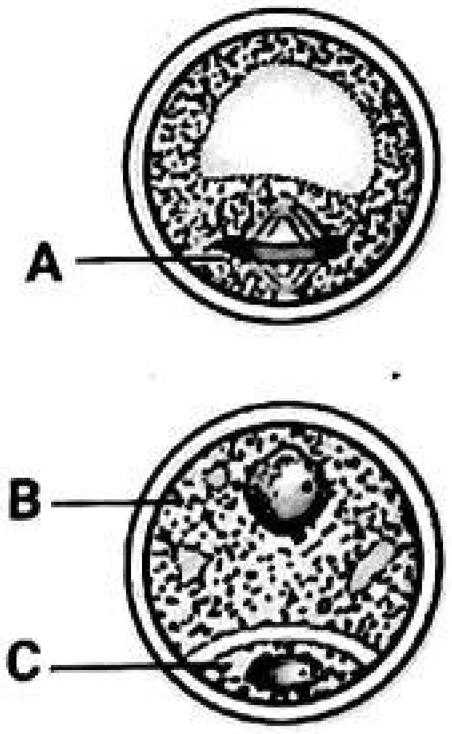
5 Regarding the given diagram:



Statement I:	It shows a pollen tetrad.
Statement II:	The four microspores are contained by callose walls.

1.	**Statement I** is correct, **Statement II** is correct.
2.	**Statement I** is incorrect, **Statement II** is correct.
3.	**Statement I** is correct, **Statement II** is incorrect.
4.	**Statement I** is incorrect, **Statement II** is incorrect.

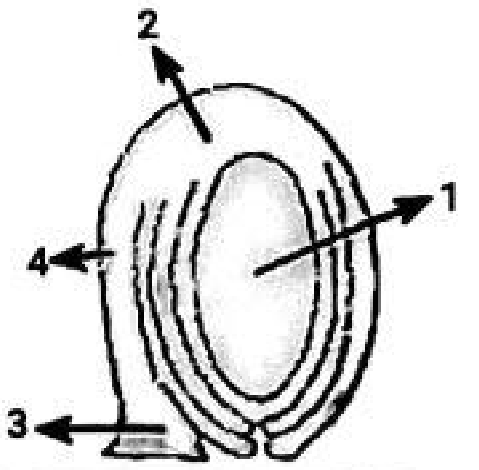
6 Study the stages of maturation of microspore into a pollen grain and select the correct statements:



Statement I:	The spindle formation as seen in A is strictly symmetric.
Statement II:	The larger cell [B] is the generative cell and the smaller cell [C] is the vegetative cell.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

7 The correct description of the structure shown in the figure would be:



1.	Anatropous ovule; 1 – Nucellus; 2 – Chalaza; 3 – Raphe; 4 – Funiculus
2.	Orthotropous ovule; 1 – Nucellus; 2 – Micropyle; 3 – Raphe; 4 – Funiculus
3.	Anatropous ovule; 1 – Nucellus; 2 – Chalaza; 3 – Funiculus; 4 – Raphe
4.	Anatropous ovule; 1 – Nucellus; 2 – Micropyle; 3 – Raphe; 4 – Funiculus

8 Match each item in Table I with one in Table II and select the correct match from the codes given:

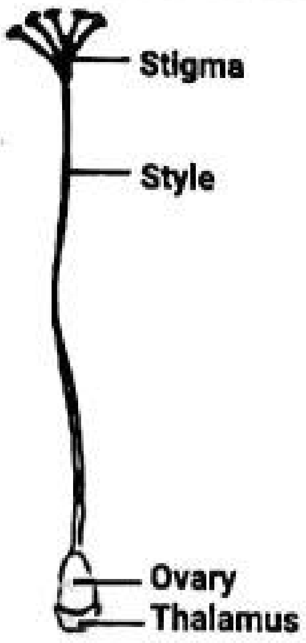
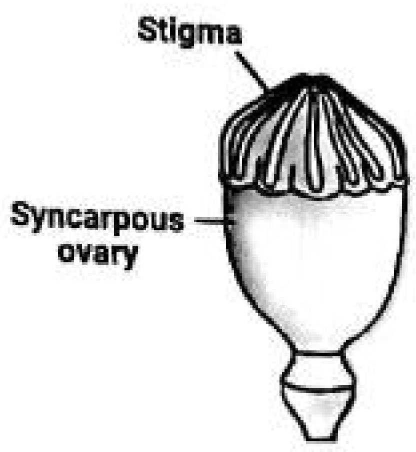
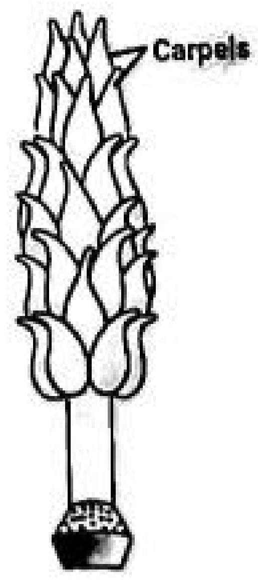
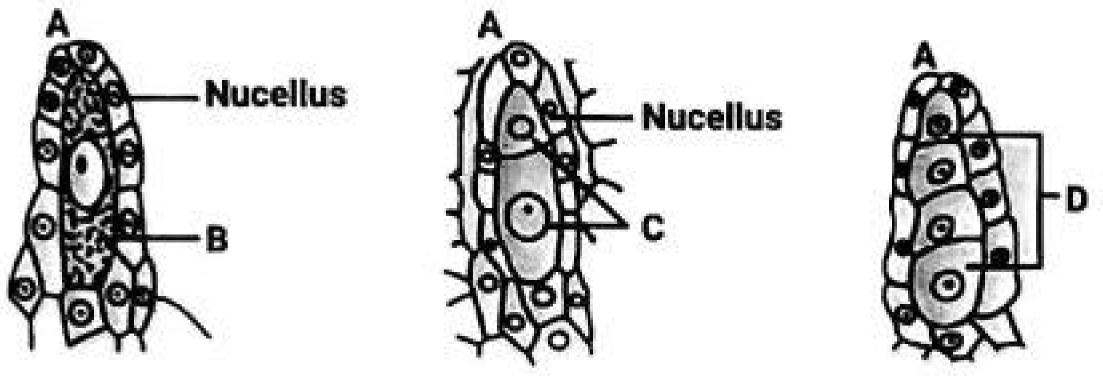
Table I:		
A.	B.	C.
		

Table II	
P.	A dissected flower of *Hibiscus* showing pistil where other floral parts have been removed
Q.	Multicarpellary, syncarpous pistil of *Papaver*
R.	Multicarpellary, apocarpous gynoecium of *Michelia*

Codes:

	A	B	C
1.	P	Q	R
2.	P	R	Q
3.	Q	R	P
4.	R	P	Q

9 Regarding part I of the diagram:

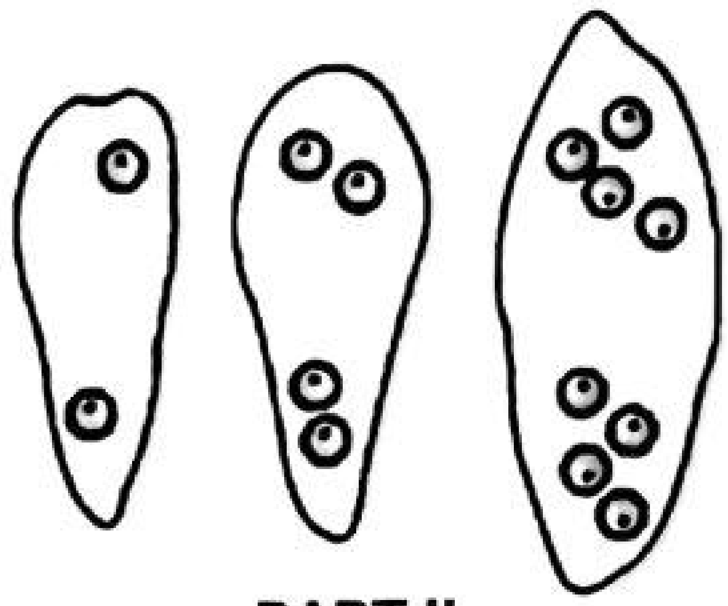


PART I

Statement I:	A is the Chalazal end.
Statement II:	B is the microspore mother cell, C is the microspore dyad and D is the microspore tetrad.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

10 Regarding part II of the diagram:

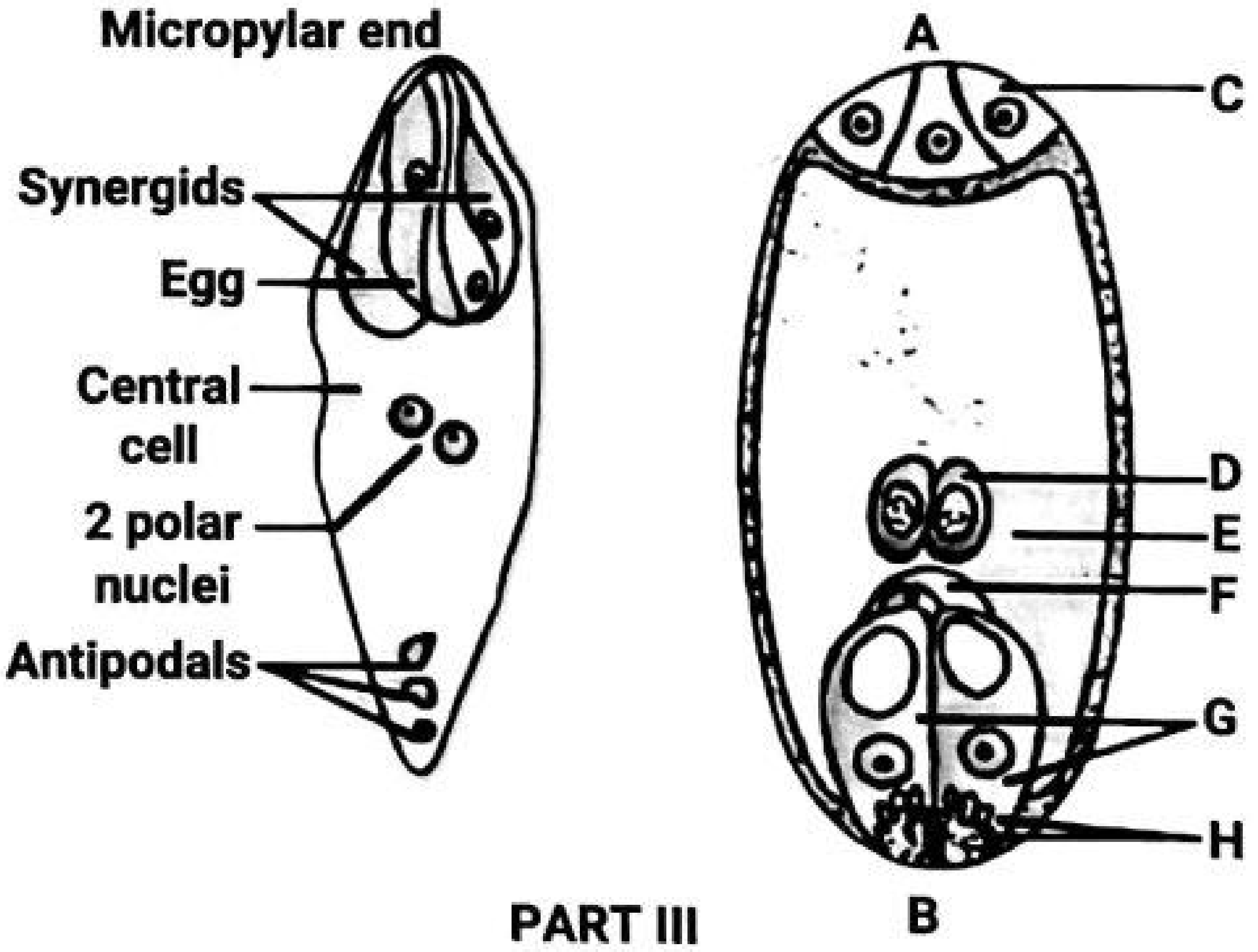


PART II

Statement I:	It shows the two, four, and eighth nucleate stages of the embryo sac.
Statement II:	The divisions are mitotic and free nuclear.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, Statement II is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

11 Regarding part III of the diagram:



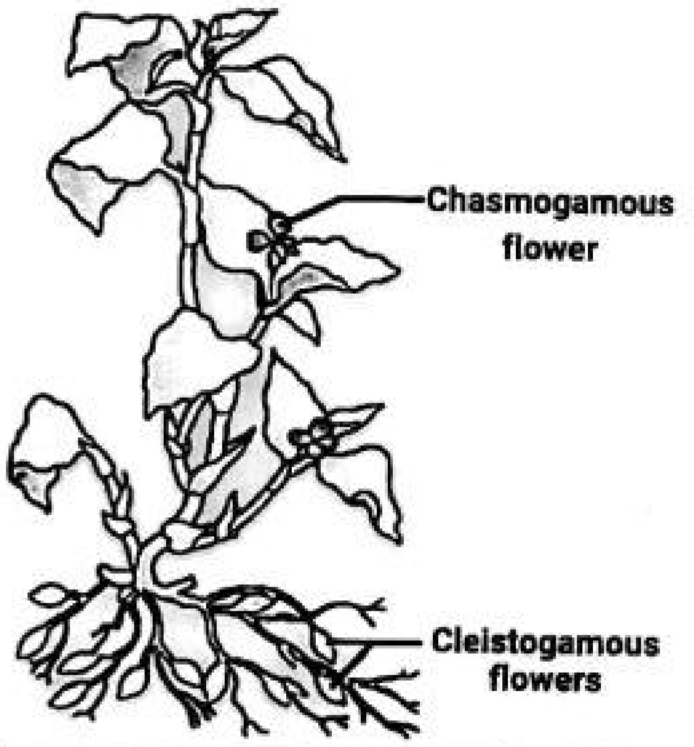
PART III

Statement I:	It represents mature embryosac or the female gametophyte in an angiosperm.
Statement II:	A is the micropylar end and B is the Chalazal end
Statement III:	C guides the entry of the pollen tube into the embryo sac.
Statement IV:	D is the polar nuclei and E is the central cell.
Statement V:	F is the egg cell.
Statement VI:	G is the antipodals and H is special cellular thickenings.

The correct statements are:

1.	Statement I, Statement IV, and Statement VI
2.	Statement II, Statement III, Statement IV and Statement VI
3.	Statement I, Statement IV, and Statement V
4.	All Statements are correct

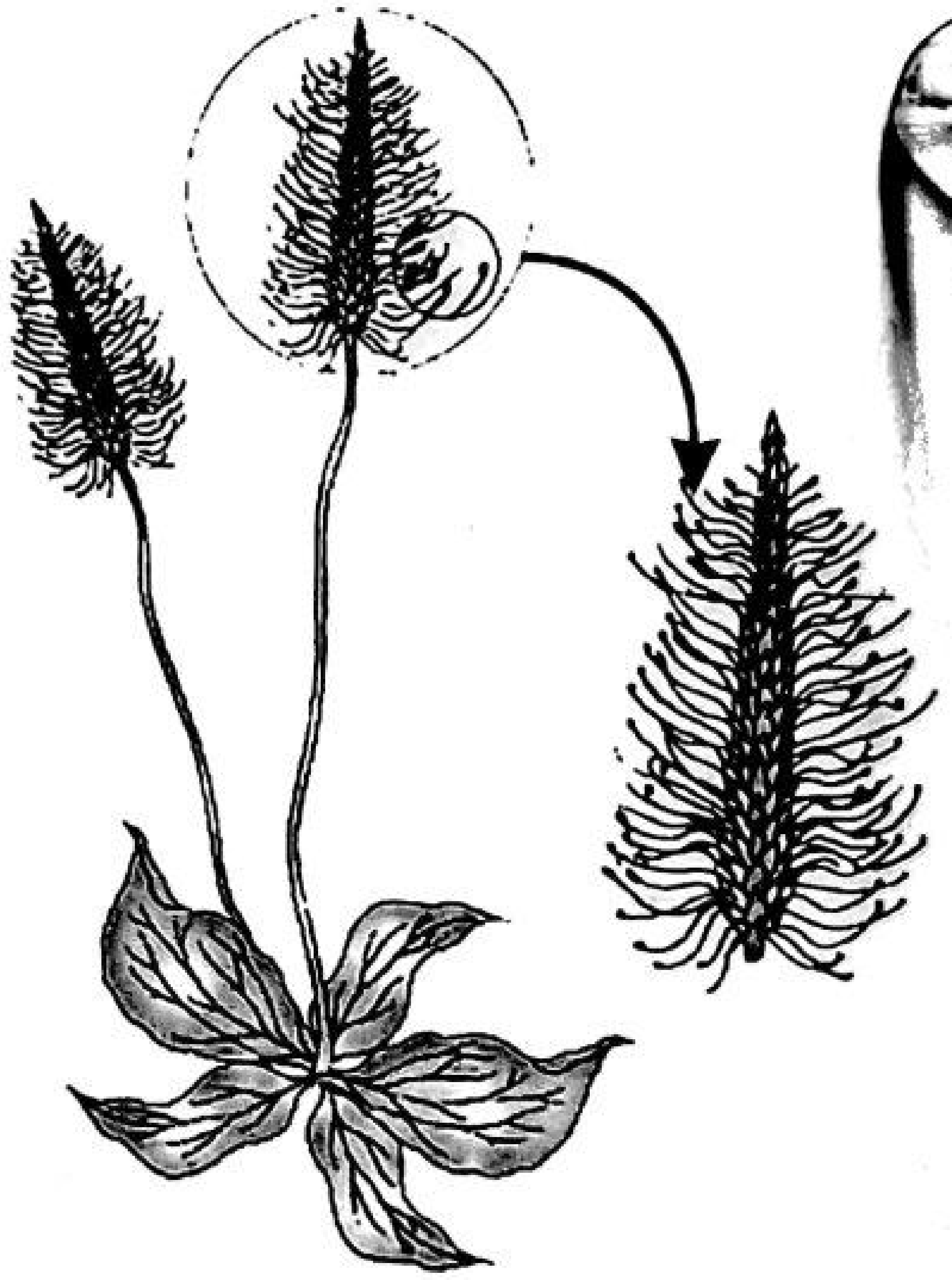
12 The diagram of NCERT given below shows two types of flowers in a certain plant:



Statement I:	Cleistogamous flowers have an advantage and a disadvantage over chasmogamous flowers.
Statement II:	Seed set is assured even in the absence of pollinators but the amount of genetic variations is less in cleistogamous flowers when compared to the chasmogamous flowers.

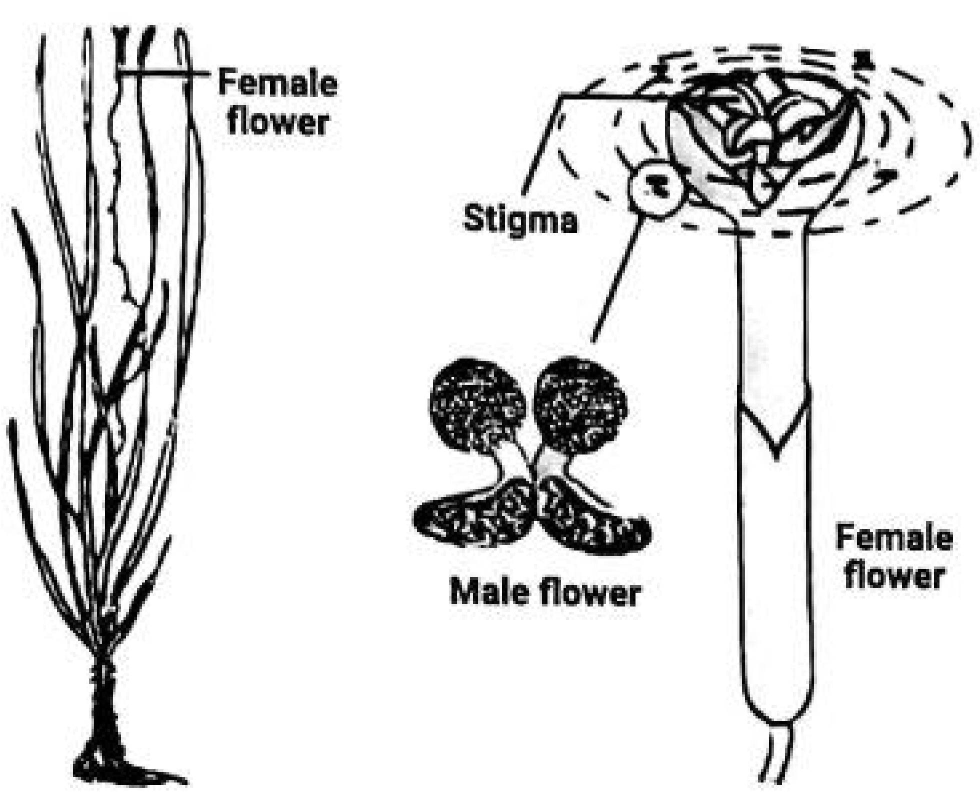
1.	**Statement I** is correct; **Statement II** is correct but **Statement II** does not explain **Statement I**.
2.	**Statement I** is correct; **Statement II** is correct and **Statement II** explains **Statement I**.
3.	**Statement I** is correct but **Statement II** is not correct.
4.	Both **Statement I** and **Statement II** are not correct.

13 The plant shown in the given diagram is most likely to be pollinated by:



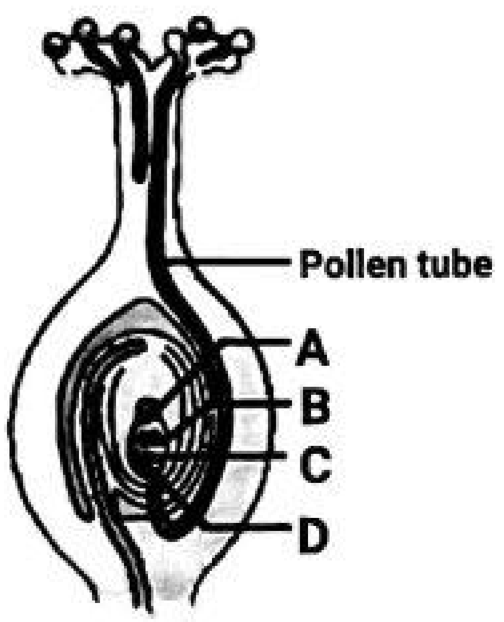
1.	Water	2.	Wind
3.	Bees	4.	Bats

14 The diagram shows:


Female flower
Stigma
Male flower
Female flower

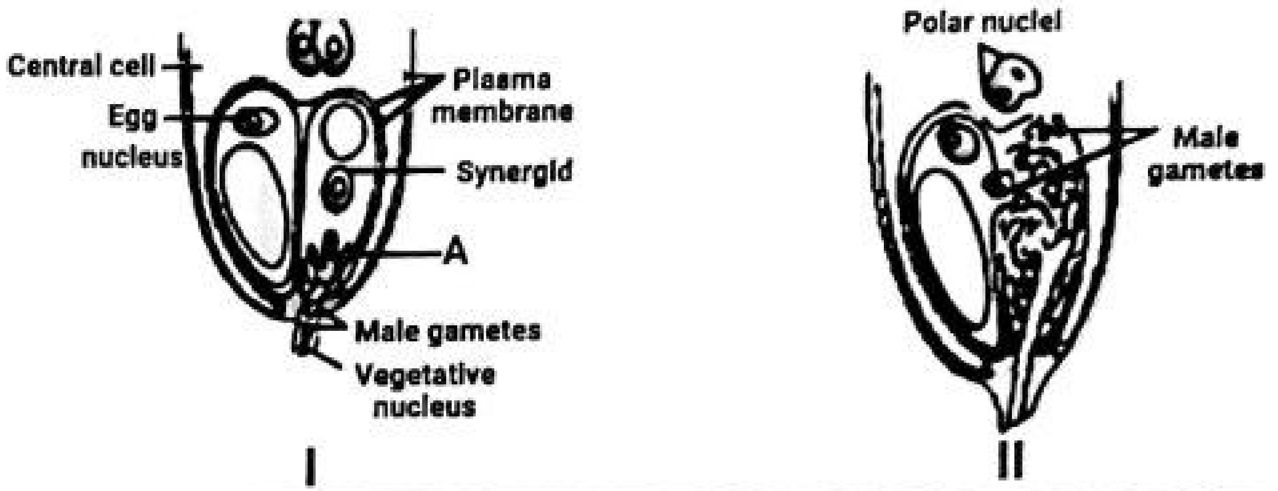
1. Pollination by water in *Vallisneria*
2. Pollination by water in *Zostera*
3. Pollination by wind in Water hyacinth
4. Pollination by the wind in Water lily

15 In the diagram identify A to D:


Pollen tube
A
B
C
D

	A	B	C	D
1.	Synergid	Polar nuclei	Male gamete	Antipodal
2.	Synergid	PEN	Male gamete	Antipodal
3.	Antipodal	Polar nuclei	Egg cell	Synergid
4.	Antipodal	PEN	Egg cell	Synergid

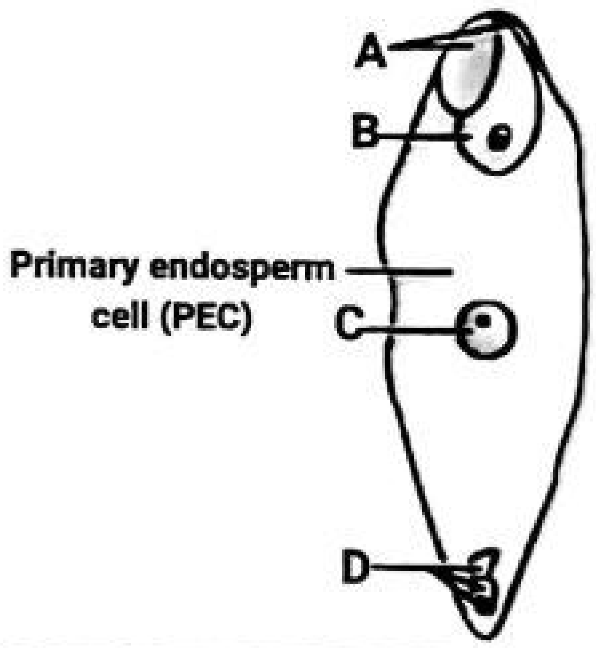
16 In the given diagram:


Central cell
Egg nucleus
Plasma membrane
Synergid
A
Male gametes
Vegetative nucleus
I
Polar nuclei
Male gametes
II

Statement I:	I shows the entry of the pollen tube into a synergid under the guidance of A.
Statement II:	II shows the discharge of male gametes into a synergid.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

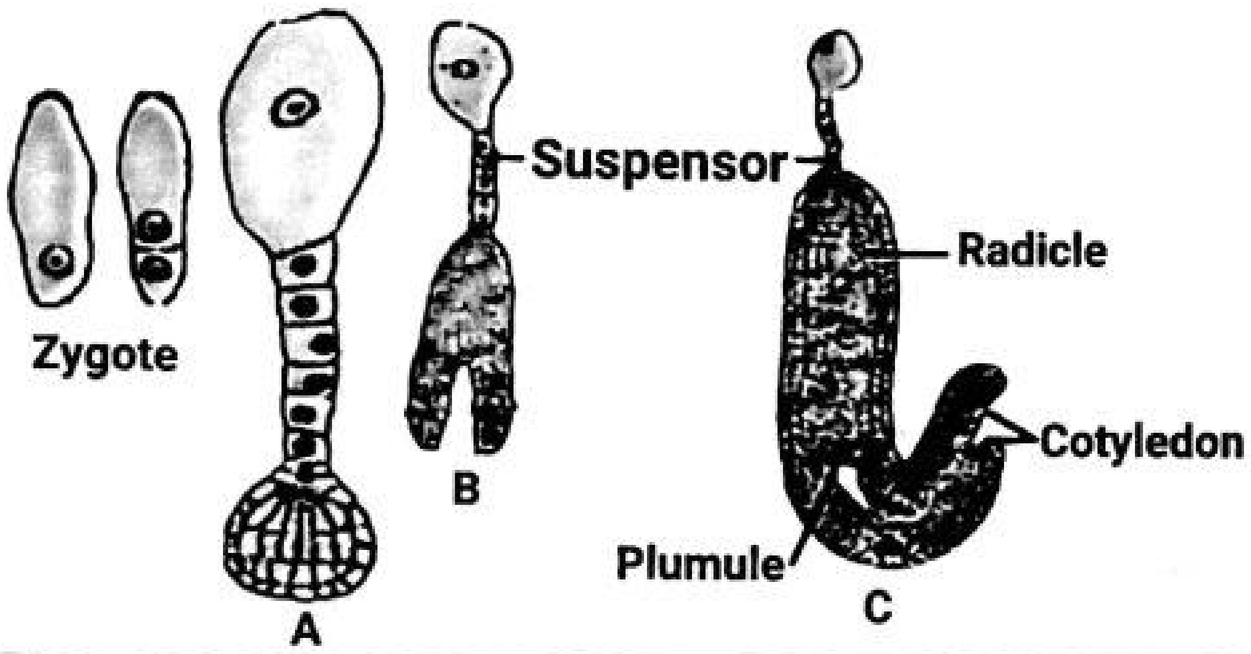
17 The diagram shows a fertilised embryo sac where:


A
B
Primary endosperm cell (PEC)
C
D

Statement I:	A is diploid and B is triploid
Statement II:	C are degenerating antipodal cells and D are degenerating synergids

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

18 The diagram shows stages in embryo development in a dicot where A, B, and C respectively are:



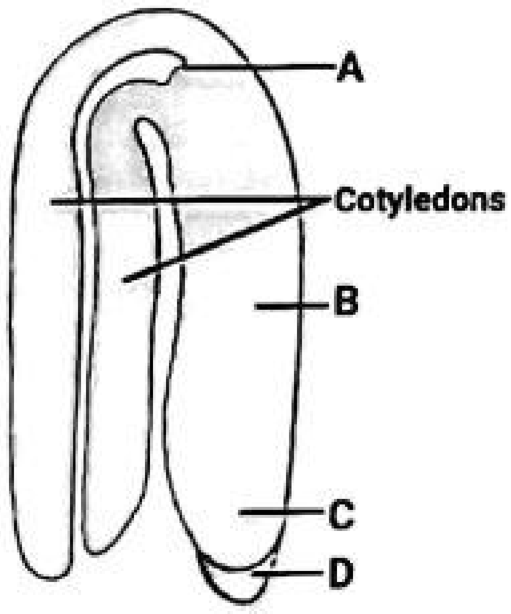
1.	Globular embryo, Heart shaped embryo, Immature Embryo
2.	Globular embryo, Heart shaped embryo, Mature Embryo
3.	Heart-shaped embryo, Globular embryo, Mature Embryo
4.	Heart-shaped embryo, Globular embryo, Immature Embryo

19 In Coconut:

Statement I:	coconut water is a cellular endosperm
Statement II:	kernel is the cellular endosperm

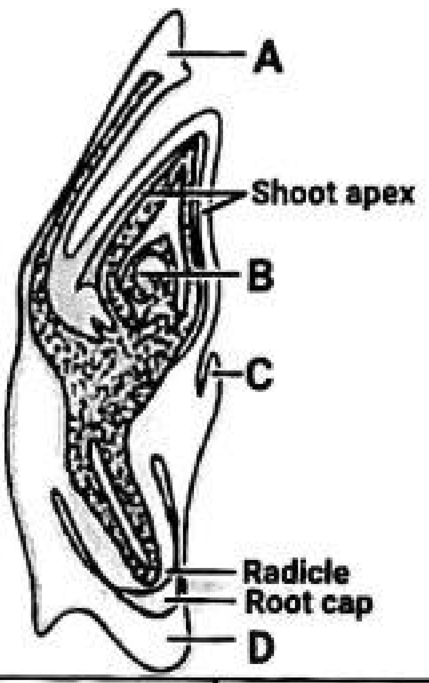
1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

20 Identify A- D in the diagram showing a typical dicot embryo:



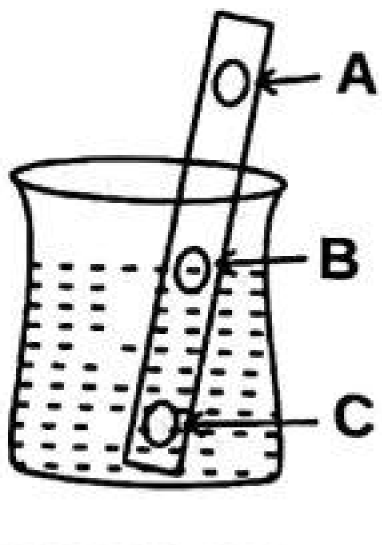
	A	B	C	D
1.	Radicle	Epicotyl	Plumule	Root cap
2.	Radicle	Epicotyl	Plumule	Coleoptile
3.	Plumule	Hypocotyl	Radicle	Root cap
4.	Plumule	Hypocotyl	Radicle	Coleoptile

21 Identify A – D in the diagram showing L.S. of an embryo of grass:



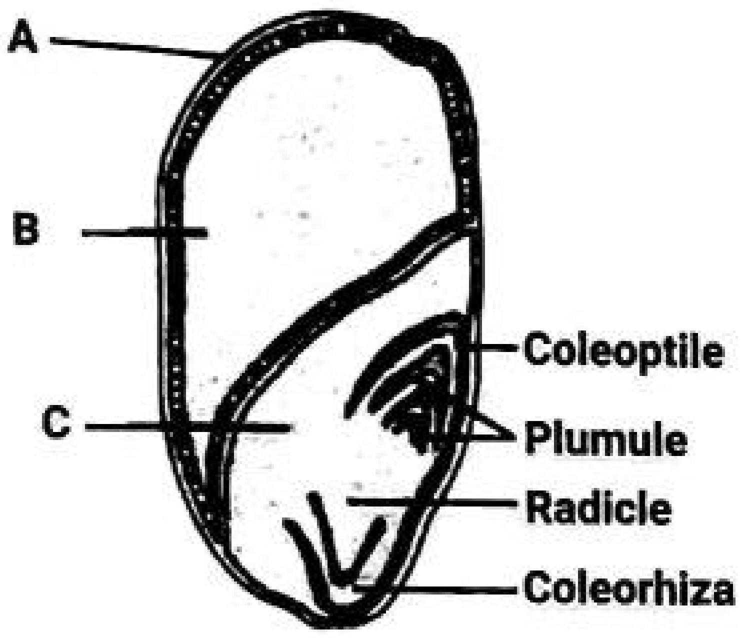
	A	B	C	D
1.	Perisperm	Coleoptile	Epiblast	Coleorrhiza
2.	Scutellum	Coleoptile	Epiblast	Coleorrhiza
3.	Scutellum	Hypocotyl	Hypoblast	Coleoptile
4.	Scutellum	Hypocotyl	Hypoblast	Coleoptile

22 Three air-dried bean seeds are tied to a glass slide with two [A and C in the fig.] at the two ends and one [B] in the middle. This slide is placed in a beaker with the middle seed half immersed in water as shown in the fig. The water level is kept constant throughout the experiment. Which seed/s is/are expected to germinate normally?



1.	Only A	2.	Only B
3.	Only B and C	4.	Only A and C

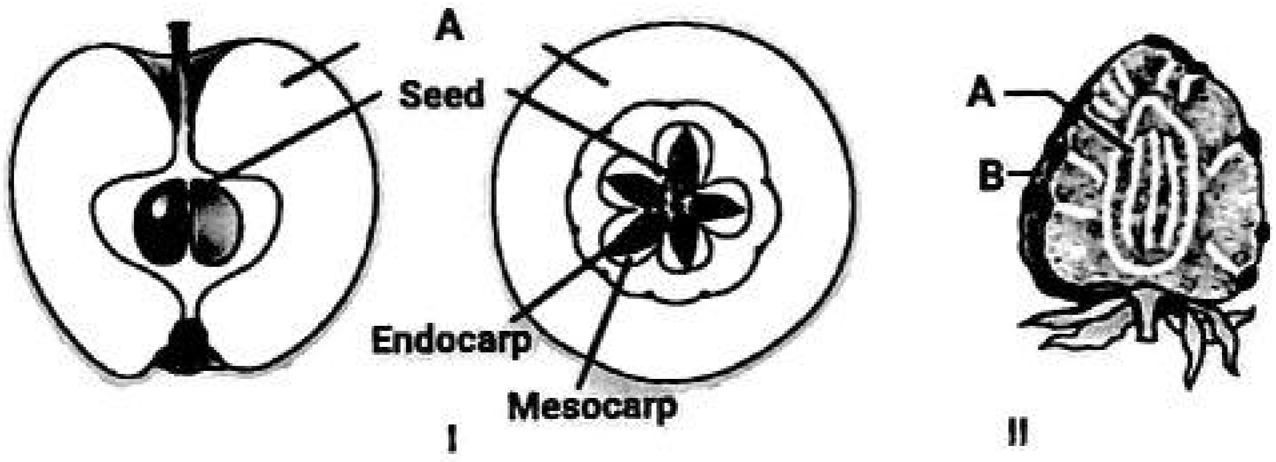
23 In the given diagram showing the structure of a monocot seed:



Statement I:	A is pericarp.
Statement II:	B is the cotyledon of the monocot seed.
Statement III:	C is triploid in nature and develops before B.

1.	Only **Statement I** is correct
2.	Only **Statement II** and **Statement III** are correct
3.	Only **Statement II** is correct
4.	Only **Statement III** is correct

24 The diagram shows the false fruits of apple and strawberry.



Statement I:	False fruits develop only from the ovary.
Statement II:	A is Thalamus and B is Achene.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

25 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

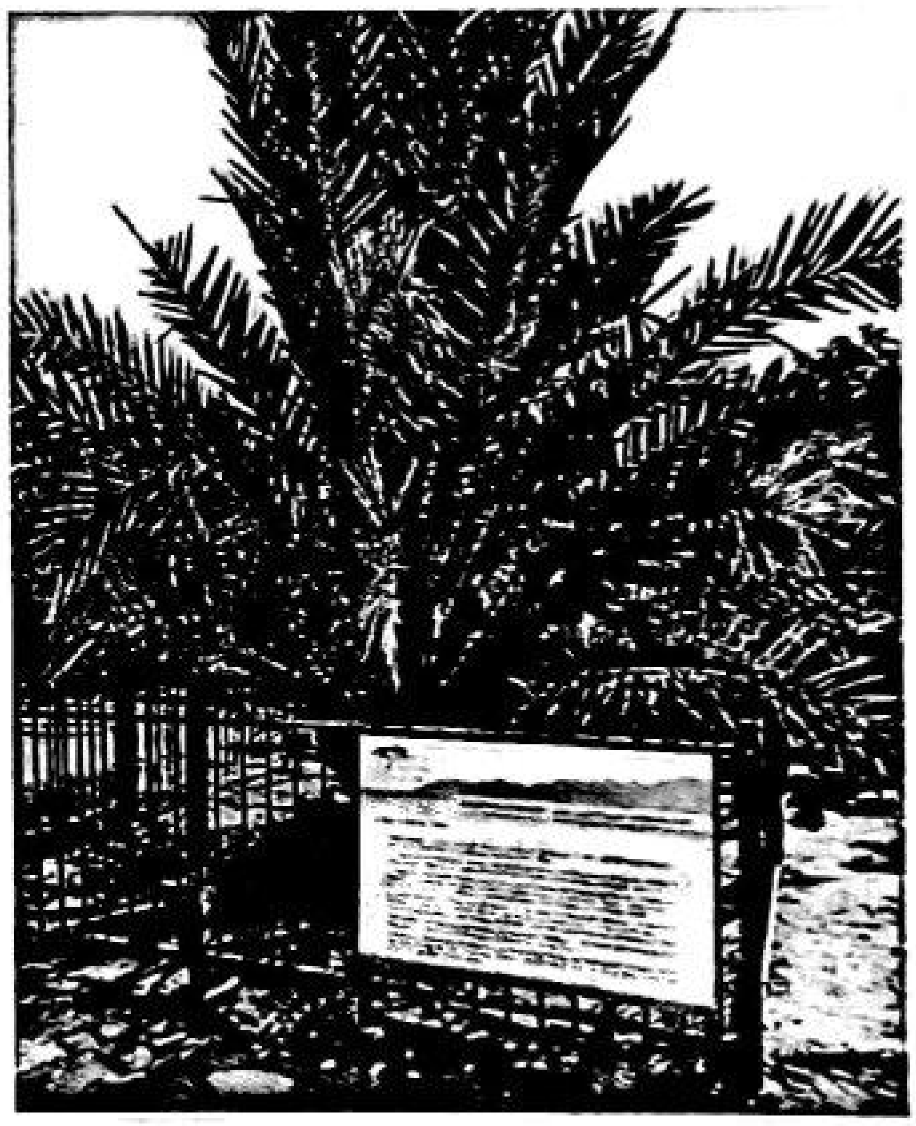
Assertion (A):	Seed is the basis of our agriculture.
Reason (R):	Dehydration and dormancy of mature seeds enable them to be stored and used as food throughout the year and also to raise the crop in the next season.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is False but **(R)** is True.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.

26 The figure shows the tree with the oldest viable seeds yet discovered found at King Herod's palace near the dead sea.

The Plant is:



1. *Lupinus arcticus*
2. *Phoenix dactylifera*
3. *Cycas revoluta*
4. *Gnetum*

27 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	An apomixis is a form of asexual reproduction that mimics sexual reproduction.
Reason (R):	There is no fertilisation in apomicts plants and they do not produce any seeds.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.

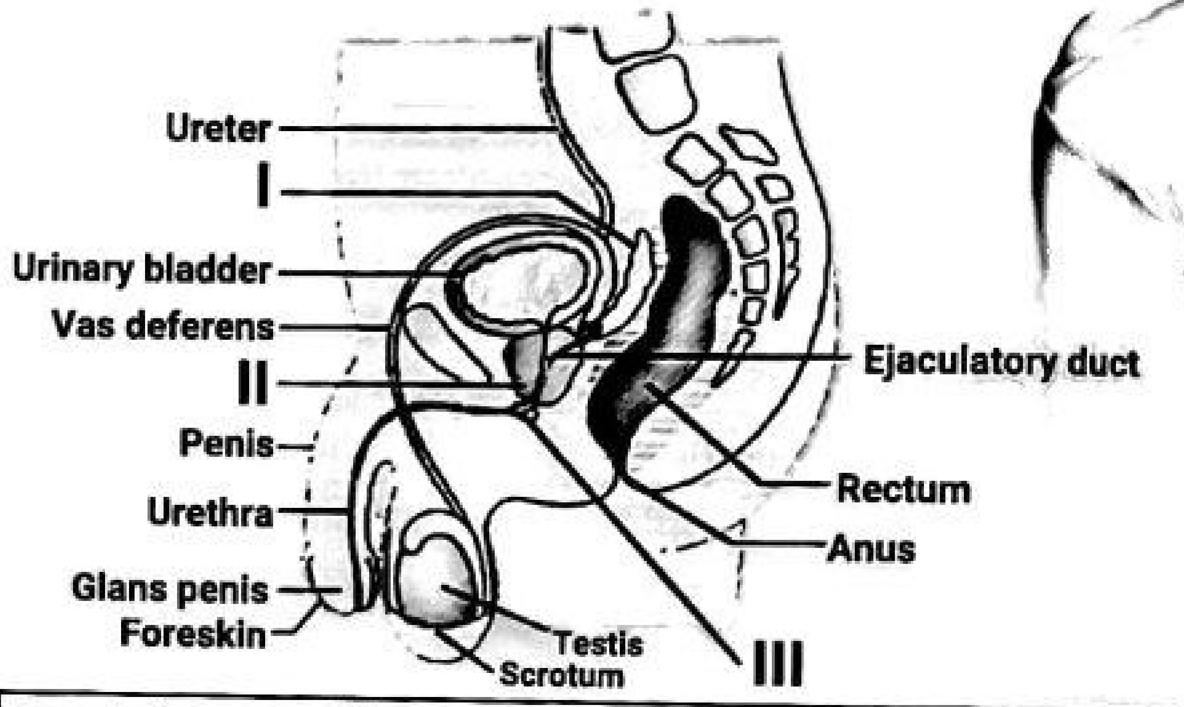
28 Identify the direct statements:

Statement I:	In some apomicts, the diploid egg cell is formed without reduction division and develops into the embryo without fertilisation.
Statement II:	In many *Citrus* and mango varieties, some of the nucellar cells surrounding the embryo sac start dividing, protrude into the embryo sac, and develop into the embryos and this is called as nucellar polyembryony.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is incorrect, **Statement II** is correct
3.	**Statement I** is correct, **Statement II** is incorrect
4.	**Statement I** is incorrect, **Statement II** is incorrect

HUMAN REPRODUCTION

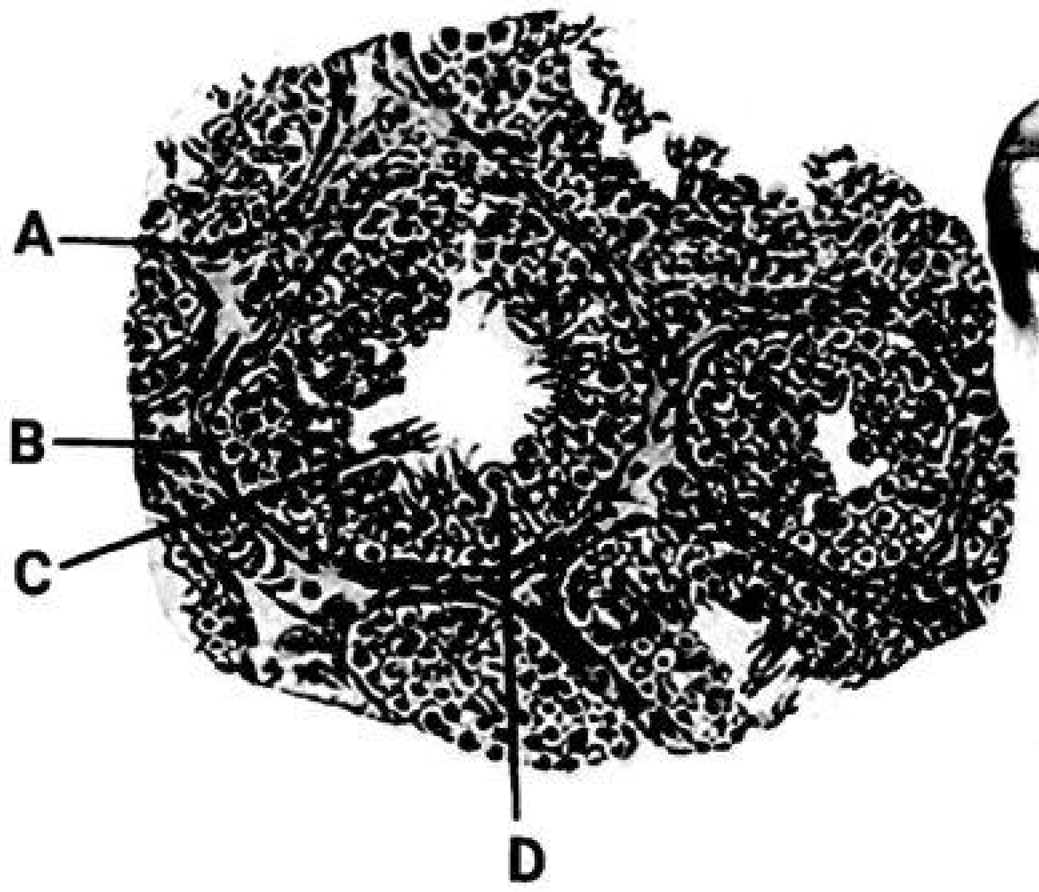
29 Study the given diagrammatic sectional view of the male pelvis showing the reproductive system and select the correct statements as your answer:



A:	I contributes acidic fluid to the seminal plasma.
B:	II is an unpaired gland.
C:	III stores sperms.

1.	Only **B**	2.	Only **A** and **C**
3.	Only **C**	4.	**A, B,** and **C**

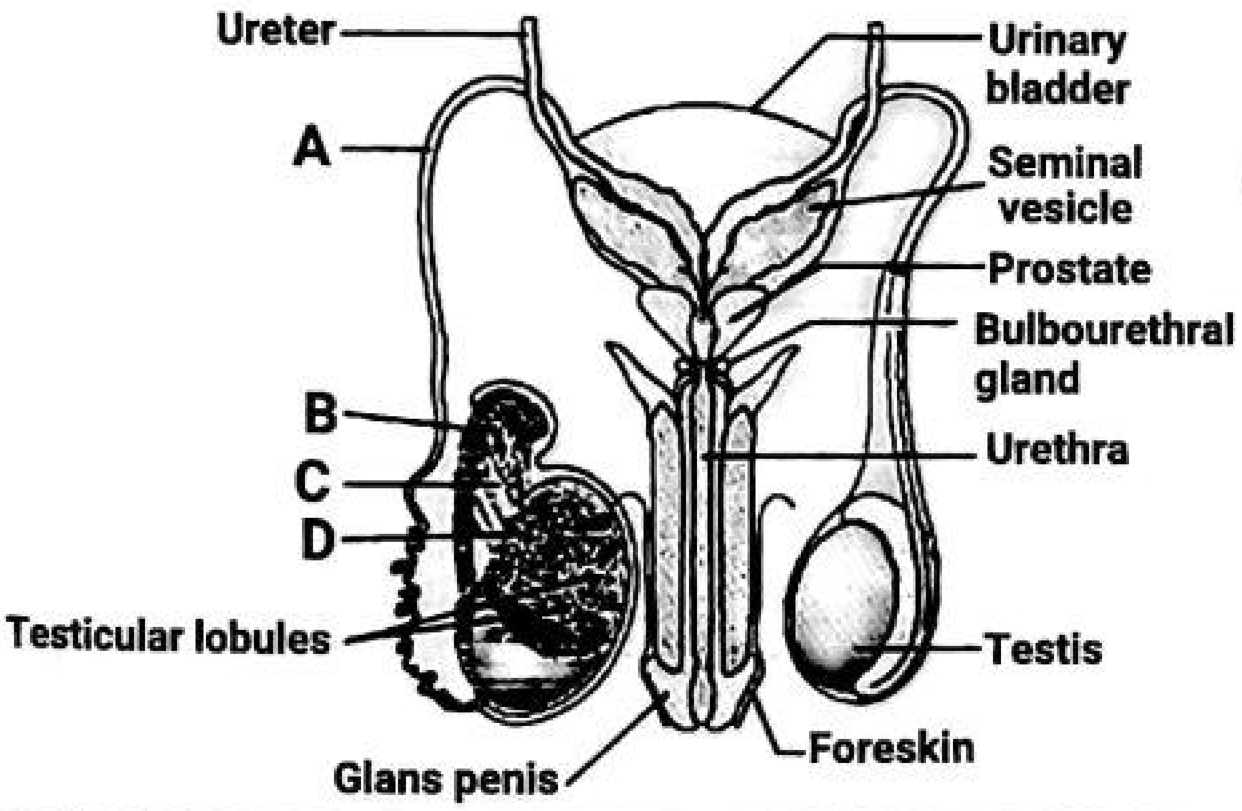
30 In the diagrammatic sectional view of the seminiferous tubule, which structures shown in the diagram are correctly matched to the description given?



A:	the primary source of testosterone or androgens in males
B:	male germ cells in the inside lining of seminiferous tubules
C:	spermatids released from seminiferous tubules
D:	Present in the inside lining of seminiferous tubules, they nourish developing sperm cells

1.	Only **A**, **B**, and **C**	2.	Only **A**, **B**, and **D**
3.	Only **B**, **C**, and **D**	4.	**A**, **B**, **C**, and **D**

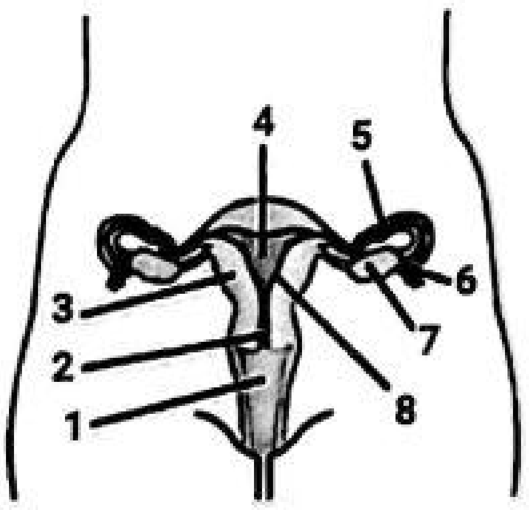
31 The diagrammatic view of the male reproduction system is shown below:


Ureter
A
B
C
D
Testicular lobules
Glans penis
Urinary bladder
Seminal vesicle
Prostate
Bulbourethral gland
Urethra
Testis
Foreskin

I:	A is the duct that ascends from the scrotum into the lower abdomen.
II:	B is the part where the sperms are stored and get mature.
III:	C leaves the testes.
IV:	D carries sperm from the seminiferous tubules to C.

1. Only **IV** is incorrect.
2. Only **III** is incorrect.
3. Only **I** and **II** are incorrect.
4. **I**, **II**, **III**, and **IV** are correct.

32 Identify the part that helps in the collection of the ovum after ovulation:



1.	4	2.	5
3.	6	4.	7

33 Based on the image in Q32, which part undergoes cyclical changes during the menstrual cycle?

1.	3	2.	1
3.	2	4.	8

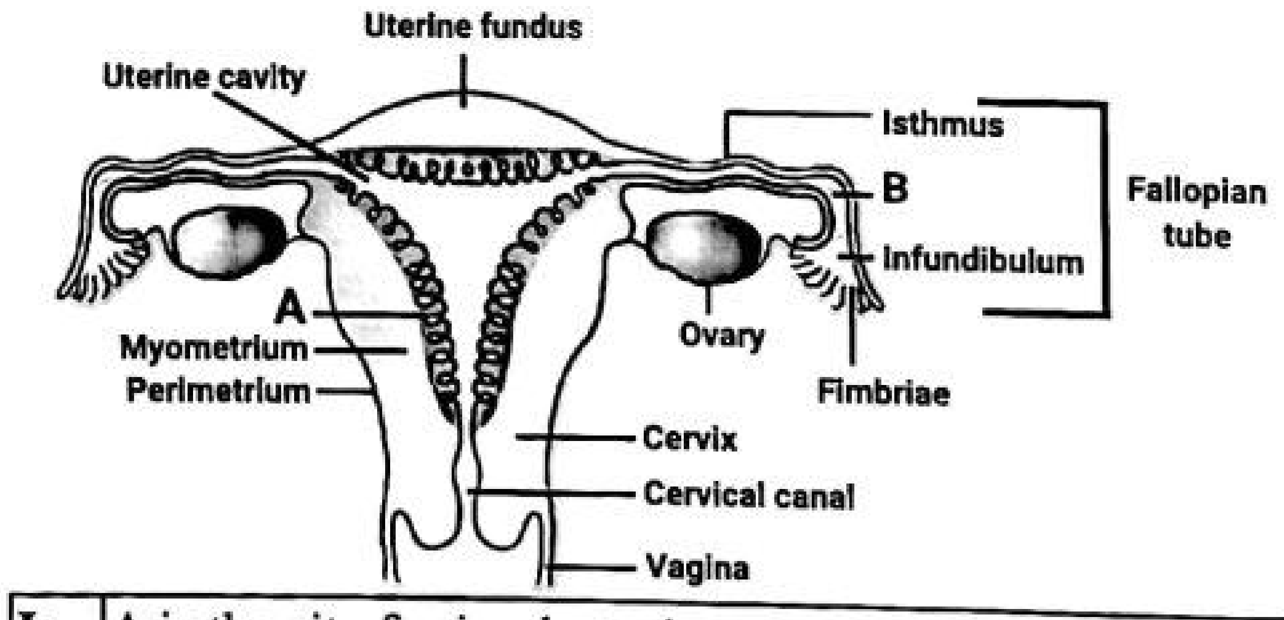
34 Based on the image in Q32, which part exhibits strong contractions during the delivery of the baby?

1.	3	2.	1
3.	2	4.	8

35 Based on the image in Q32, which label represents the cervix?

1.	1	2.	2
3.	4	4.	7

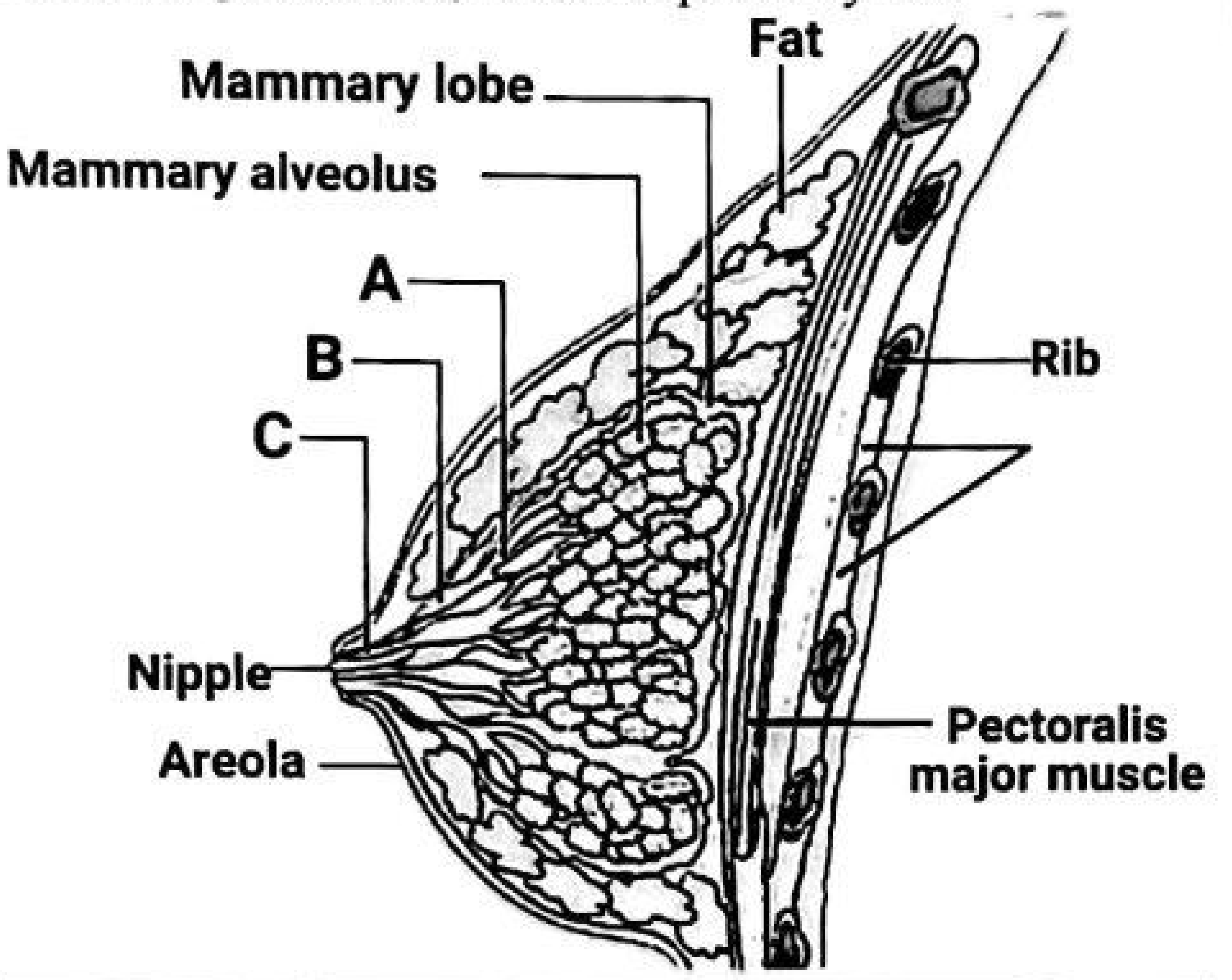
36 In the given diagrammatic sectional view of the female reproductive system:


Uterine fundus
Uterine cavity
Isthmus
B
Fallopian tube
Infundibulum
A
Myometrium
Perimetrium
Ovary
Fimbriae
Cervix
Cervical canal
Vagina

I:	A is the site for implantation
II:	B is the most common site for fertilisation

1.	Only **I** is correct.	2.	Only **II** is correct.
3.	Both **I** and **II** are correct.	4.	Both **I** and **II** are incorrect.

37 In the given diagrammatic sectional view of the mammary gland, A, B, and C respectively are:



	A	B	C
1.	Mammary duct	Lactiferous duct	Ampulla
2.	Lactiferous duct	Ampulla	Mammary duct
3.	Ampulla	Mammary duct	Lactiferous duct
4.	Mammary duct	Ampulla	Lactiferous duct

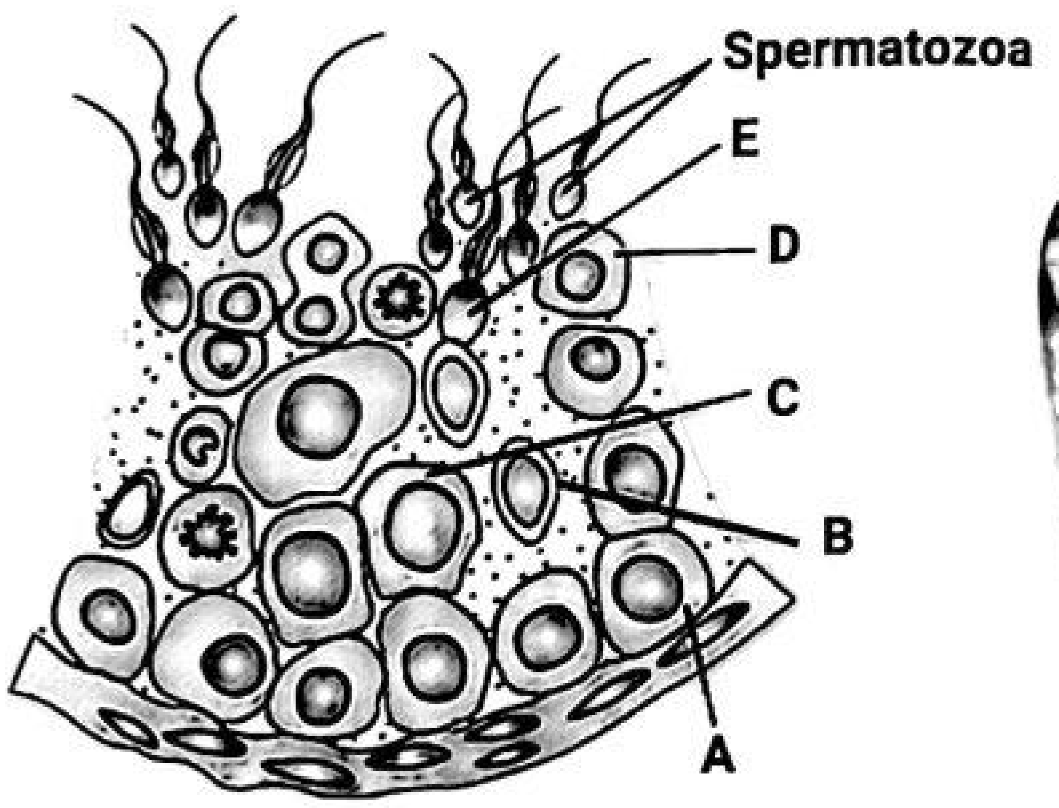
38 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Sperms constitute the majority of the volume of the semen ejaculated.
Reason (R):	There are about 300 million sperms per ml of the ejaculate.

In the light of the above statements, choose the most appropriate answer from the options given below :

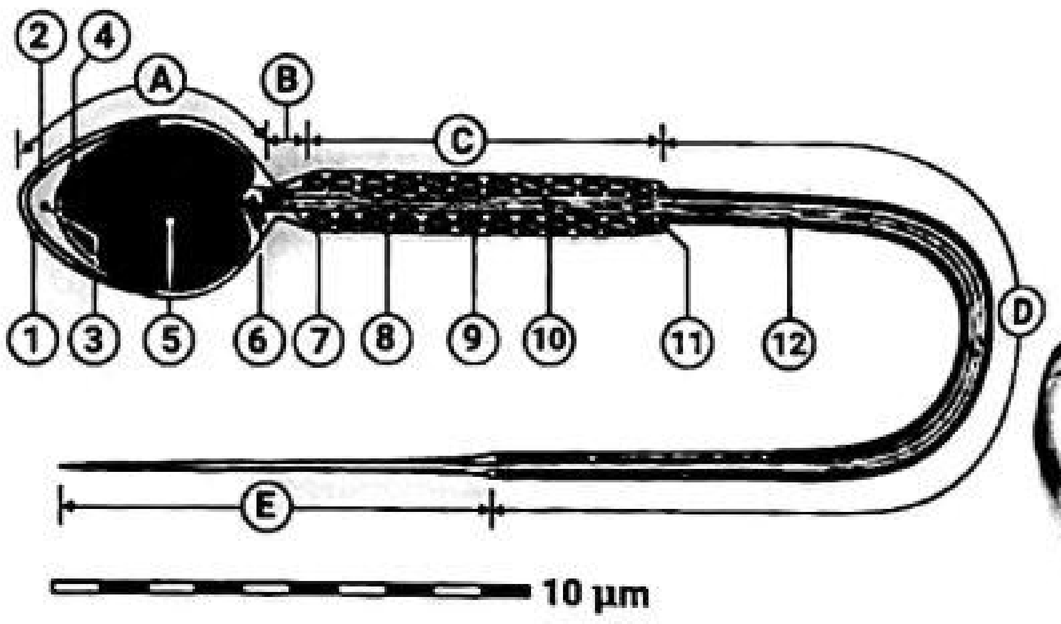
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

39 In the given diagrammatic sectional view of a seminiferous tubule, cells that nourish developing sperms and the cells that undergo reduction division are respectively represented by the letters:



1.	B and C	2.	B and D
3.	A and E	4.	C and E

40 Which labeled part contains enzymes that help fertilization of the ovum?



1.	3	2.	5
3.	8	4.	12

41 Based on the image in Q40, what is the part labeled as "6"?

1.	Ribosomes	2.	Golgi Apparatus
3.	Centriole	4.	Endoplasmic reticulum

42 Based on the image in Q40, which segment contains numerous mitochondria that produce energy for the movement of sperms?

1.	A	2.	B
3.	C	4.	D

43 Based on the image in Q40, what is the label assigned to the haploid nucleus of the sperm?

1.	3	2.	5
3.	9	4.	7

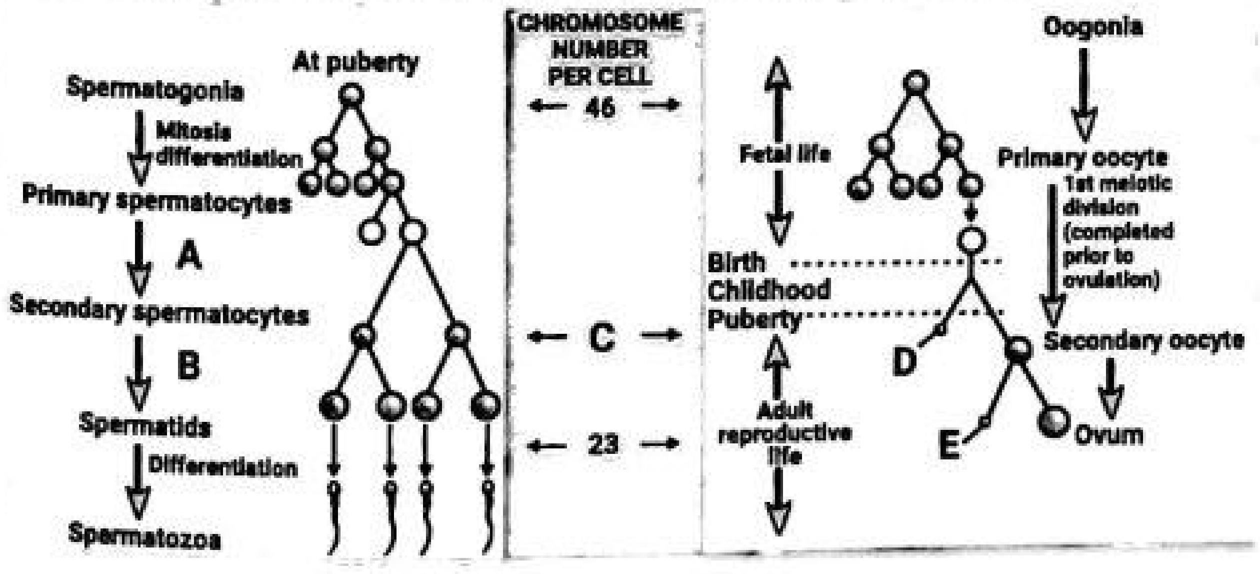
44 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	It is important that the secondary oocyte aquires almost all of the cytoplasm from the primary oocyte.
Reason (R):	This increases its chances of sustaining the early embryo should the oocyte be fertilized.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

45 In the schematic representation of gametogenesis in humans, what will be the correct description for A- E?


At puberty
Spermatogonia
Mitosis differentiation
Primary spermatocytes
A
Secondary spermatocytes
B
Spermatids
Differentiation
Spermatozoa
CHROMOSOME NUMBER PER CELL
46
C
23
Fetal life
Birth
Childhood
Puberty
Adult reproductive life
Oogonia
Primary oocyte
1st meiotic division (completed prior to ovulation)
Secondary oocyte
Ovum
D
E

	A	B	C	D	E
1.	First meiotic division	Second Meiotic division	23	First polar body	Second polar body
2.	Mitosis and differentiation	First meiotic division	23	First polar body	Secondary polar body
3.	First meiotic division	Second Meiotic division	46	First polar body	Second polar body
4.	Mitosis and differentiation	First meiotic division	46	First polar body	Secondary polar body

46 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	LH is necessary to maintain luteal function for the second two weeks of the menstrual cycle.
Reason (R):	If fertilization does not occur, LH is continued to be secreted in low concentration in the luteal phase.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

47 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In a female with 29 days menstrual cycle, ovulation occurs on day fourteen.
Reason (R):	The preovulatory phase of the menstrual cycle is of a fixed duration of 14 days.

Choose the most appropriate answer:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

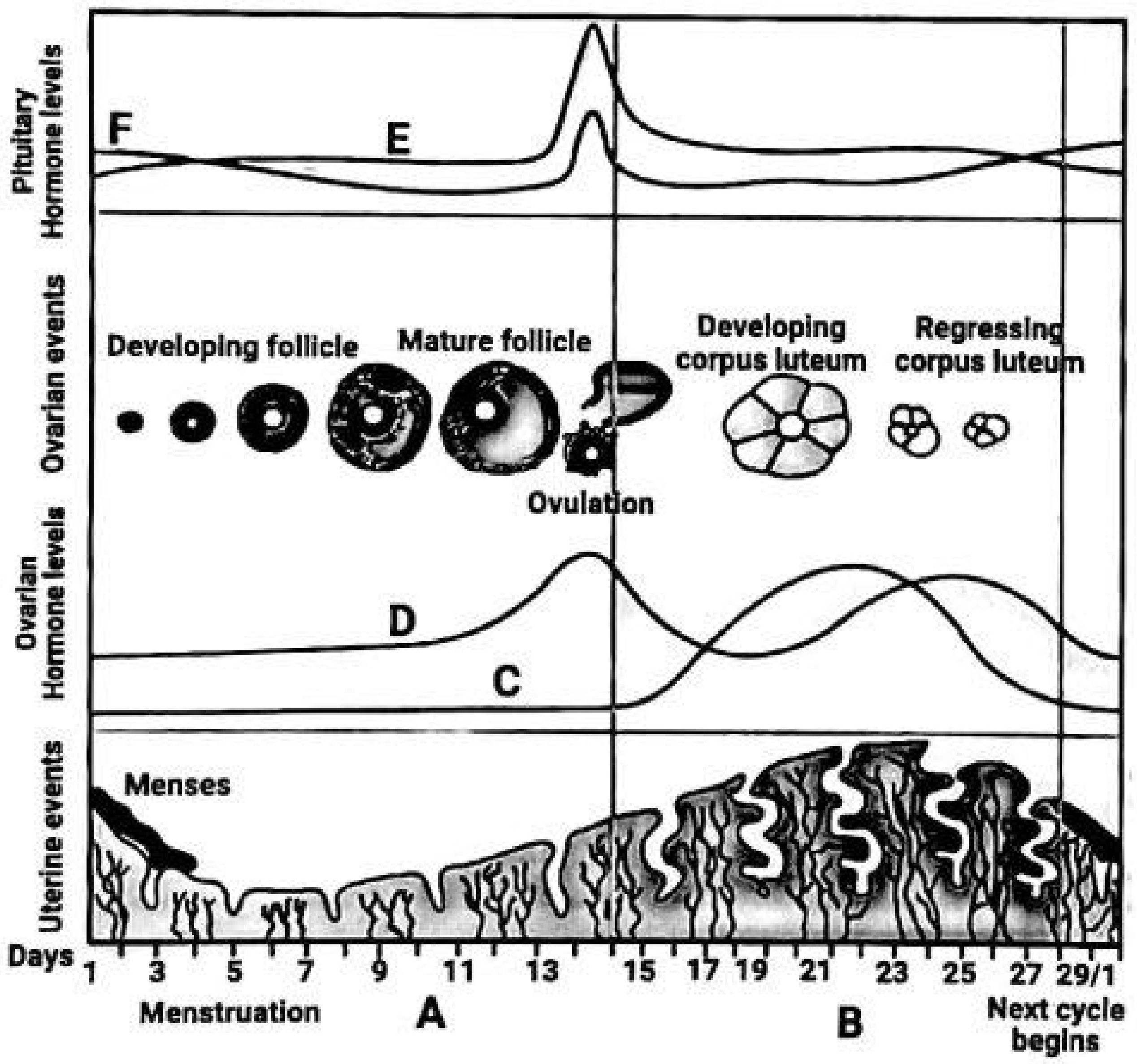
48 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In the absence of fertilization, the corpus luteum degenerates into a corpus albicans.
Reason (R):	The levels of estrogen and progesterone are highly reduced towards the end of the luteal phase.

Choose the most appropriate answer:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

49


Pituitary Hormone levels
F
E
Ovarian events
Developing follicle
Mature follicle
Developing corpus luteum
Regressing corpus luteum
Ovulation
Ovarian Hormone levels
D
C
Uterine events
Menses
Days 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29/1
Menstruation
A
B
Next cycle begins

Identify the correct statements:

Statement I:	A is also called as secretory phase and is the phase of the menstrual cycle where the follicle matures into a Graafian follicle.
Statement II:	B is the luteal phase and is the phase when the uterine endometrium regenerates through proliferation.

1. Only **Statement I**
2. Only **Statement II**
3. Both **Statement I** and **Statement II**
4. Neither **Statement I** nor **Statement II**

50 Based on the image in Q49, identify the correct statements:

Statement I:	C is secreted in large amounts by the corpus luteum and is called the pregnancy hormone.
Statement II:	D is responsible for the development of secondary sexual characters in females.

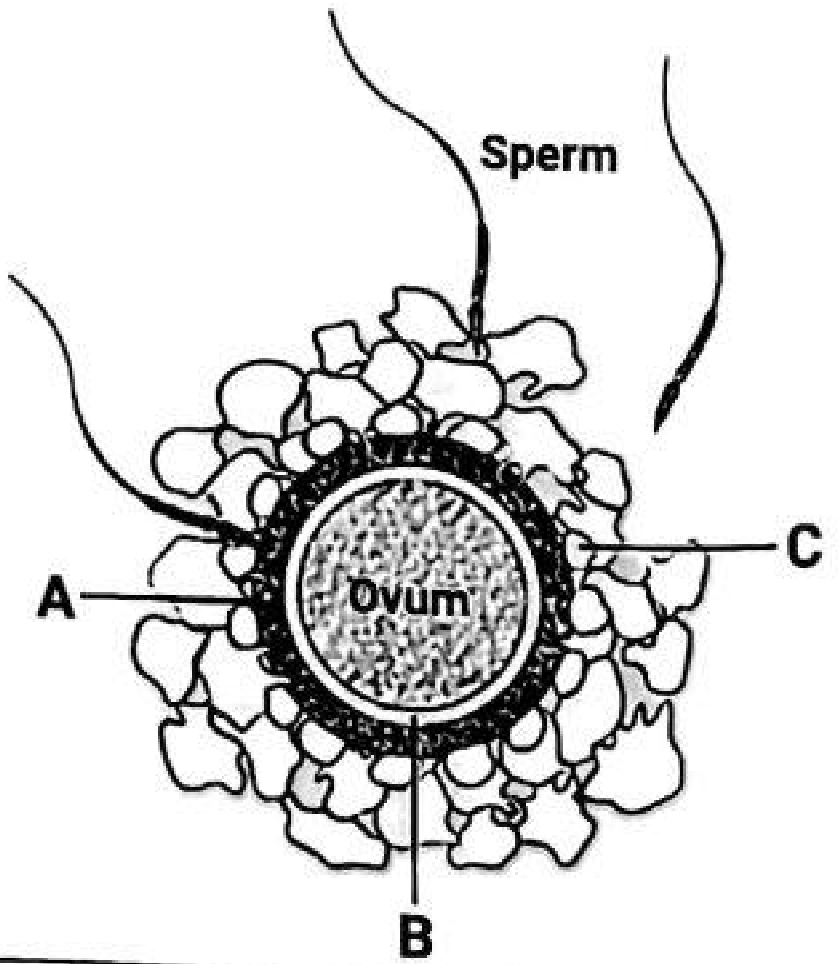
1. Only Statement **I**
2. Only Statement **II**
3. Both Statement **I** and Statement **II**
4. Neither Statement **I** nor Statement **II**

51 Based on the image in Q49, identify the correct statements:

Statement I:	The dramatic increase in E is responsible for ovulation.
Statement II:	F makes the uterine endometrium highly nutritive and ready for the implantation of the blastocyst.

1. Only Statement **I**.
2. Only Statement **II**.
3. Both Statement **I** and Statement **II**.
4. Neither Statement **I** nor Statement **II**.

52 What would be true for the figure given below?


Sperm
A
Ovum
C
B

I:	A prevents polyspermy.
II:	B is the space where the polar body is released.
III:	Cells in this region secrete progesterone.

1.	Only **I**	2.	Only **I** and **II**
3.	Only **II** and **III**	4.	**I, II,** and **III**

53 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The fluid lying between cells surrounding the released secondary oocyte has progesterone that has an important role to play in fertilization.
Reason (R):	Progesterone in the fluid acts on the uterine endometrium to make it suitable for implantation.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

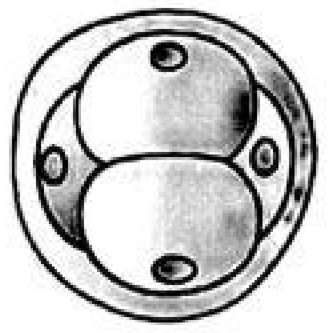
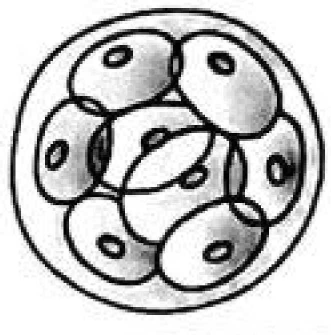
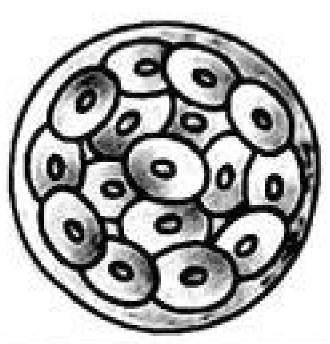
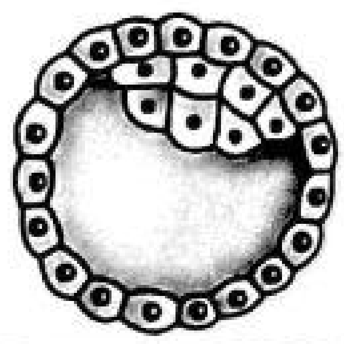
54 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Cleavage increases the number of cells and nuclear mass without increasing the cytoplasmic mass.
Reason (R):	With each successive subdivision, there is roughly half the cytoplasm in each daughter cell than before that division.

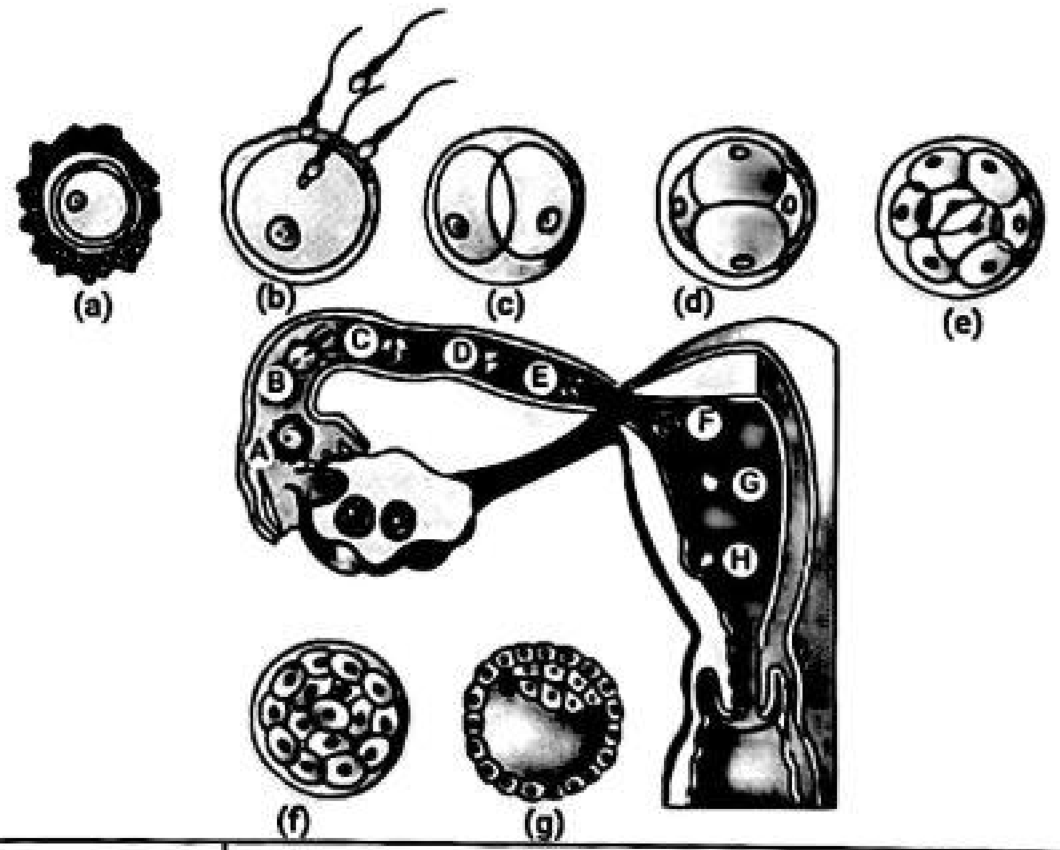
In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

55 What structure gets implanted on the wall of the uterus during embryonic development?

1.		2.	
3.		4.	

56 Study the given diagram and select the correct statements:



Statement I:	(a) is released from the ovary during ovulation and has a secondary oocyte.
Statement II:	(b), (c), and (d) show cleavage divisions, and (e) is morula.
Statement III.	(g) is blastocyst and (h) shows implantation.

1.	Only Statement **I**
2.	Only Statement **I** and Statement **III**
3.	Only Statement **II** and **III**
4.	Statement **I**, Statement **II** and Statement **III**

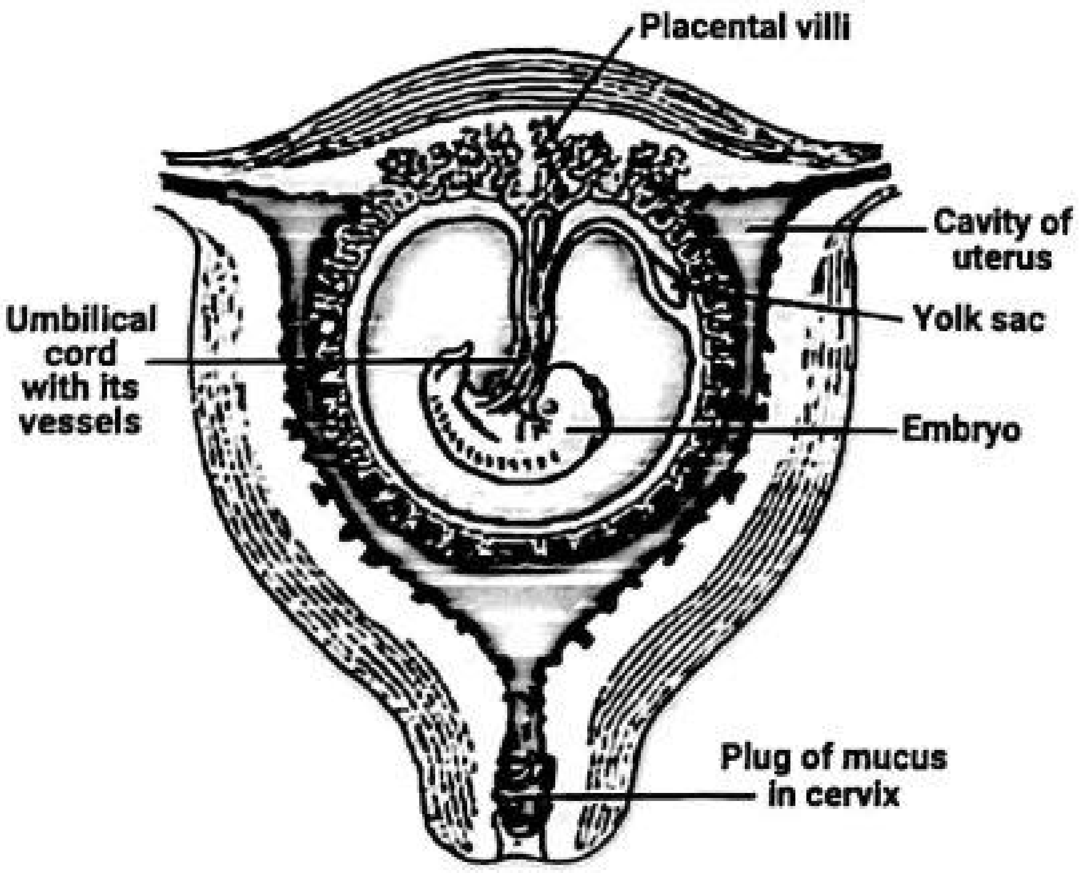
57 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**

Assertion (A):	Progesterone is sometimes called the "hormone of pregnancy".
Reason (R):	It is secreted in large amounts first by corpus luteum and later by placenta during pregnancy.

Choose the most appropriate answer:

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

58 Study the diagram showing the human foetus within the uterus and select the correct statement:



I:	Umbilical cord consists of two umbilical veins and one umbilical artery.
II:	Yolk sac is the site of earliest erythropoiesis during foetal life.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

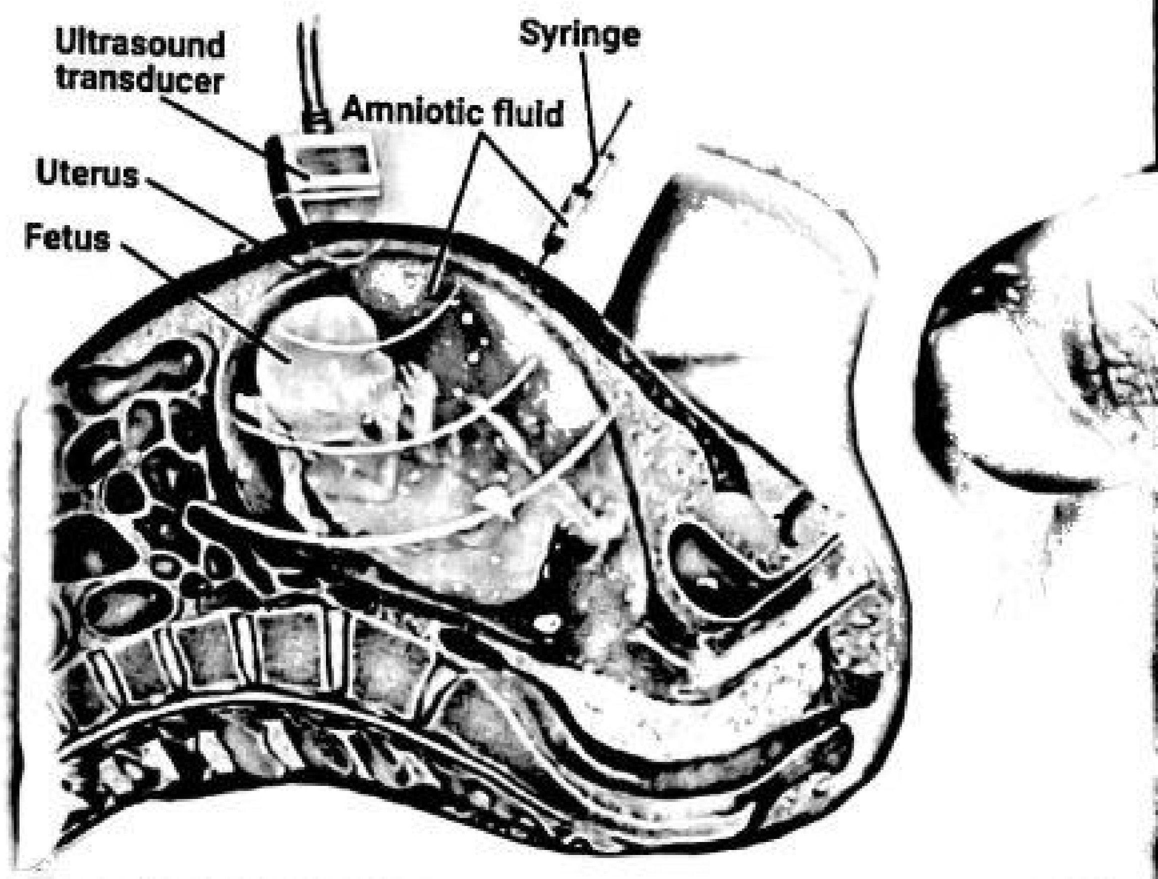
REPRODUCTIVE HEALTH

59 Consider the two statements regarding the concept of reproductive health as outlined by the World Health Organisation:

Statement I:	Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes.
Statement II:	Reproductive health implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so.

1.	**Statement I** is correct, **Statement II** is correct.
2.	**Statement I** is correct, **Statement II** is incorrect.
3.	**Statement I** is incorrect, **Statement II** is correct.
4.	**Statement I** is incorrect, **Statement II** is incorrect.

60 The given diagram shows an investigation procedure. Study the given two statements:



Statement I:	The technique is called as chorionic villi sampling.
Statement II:	This can be done only after 20 weeks of gestation period.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is correct, **Statement II** is incorrect
3.	**Statement I** is incorrect, **Statement II** is correct
4.	**Statement I** is incorrect, **Statement II** is incorrect

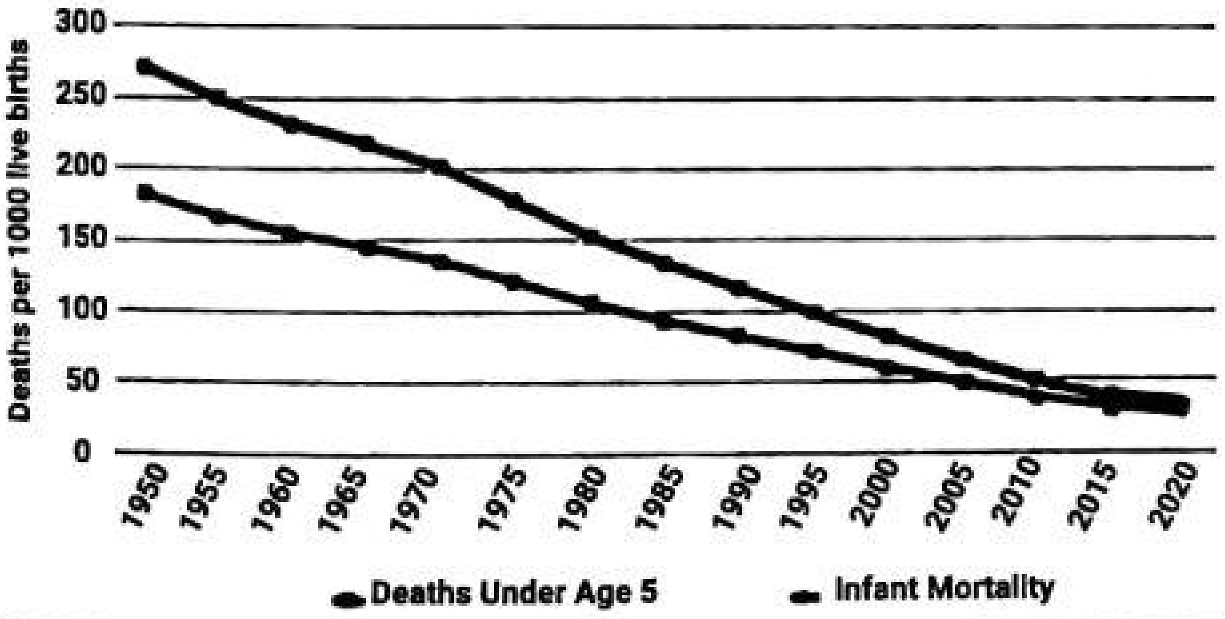
61 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The population of India is still growing.
Reason (R):	A rising birth rate and a falling death rate is responsible for this.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

62 The graph shows the change in the infant mortality rate since 1950 in India. Ignore the death under the age 5 graph. Consider the two statements:



I:	Infant mortality rate (IMR) is the probability of deaths of children under one year of age per 1000 live births.
II:	Levels of socioeconomic development and global integration are inversely related to a nation's infant mortality rate.

1.	**Statement I** is correct, **Statement II** is correct
2.	**Statement I** is correct, **Statement II** is incorrect
3.	**Statement I** is incorrect, **Statement II** is correct
4.	**Statement I** is incorrect, **Statement II** is incorrect

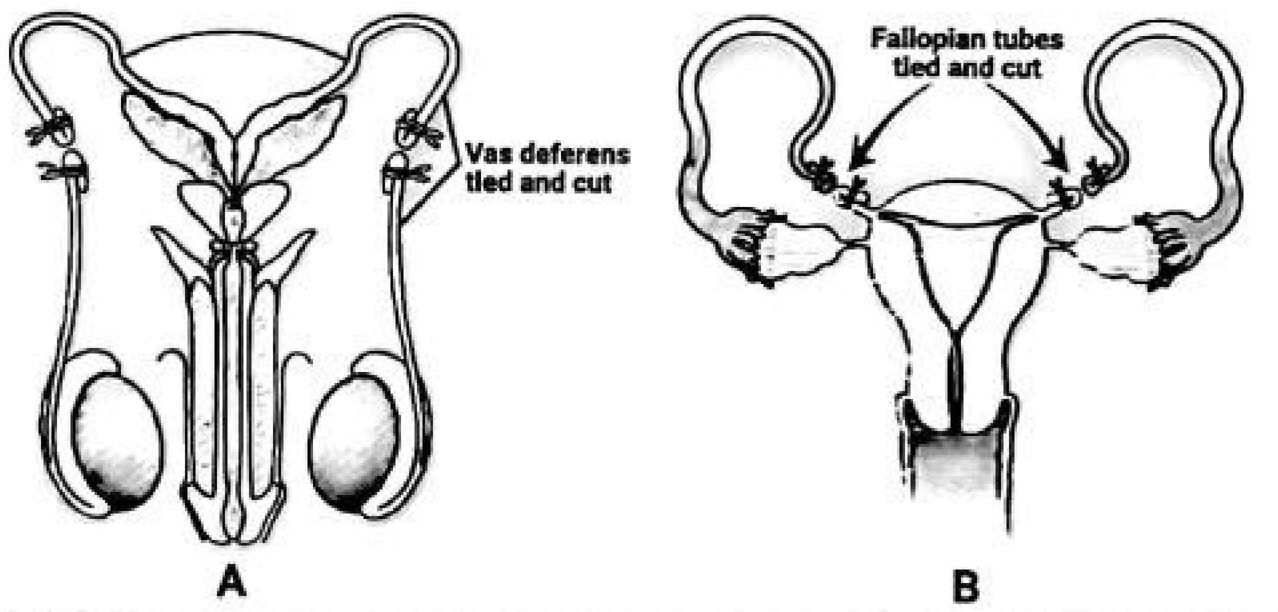
63 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The combined oral contraceptive pill alters the menstrual cycle to eliminate ovulation and prevent pregnancy.
Reason (R):	Progestogen negative feedback decreases the pulse frequency of gonadotropin-releasing hormone (GnRH) release by the hypothalamus.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

64 Consider the two surgical procedures given below and choose the correct statement:



1.	A is a more difficult procedure than B
2.	The reversibility of A is good but that of B is very poor
3.	A will make the male impotent and B will make the female infertile
4.	Both A and B can be called as sterilization procedures

65 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Hepatitis B is also considered a sexually transmitted disease.
Reason (R):	It can be spread through sexual contact.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

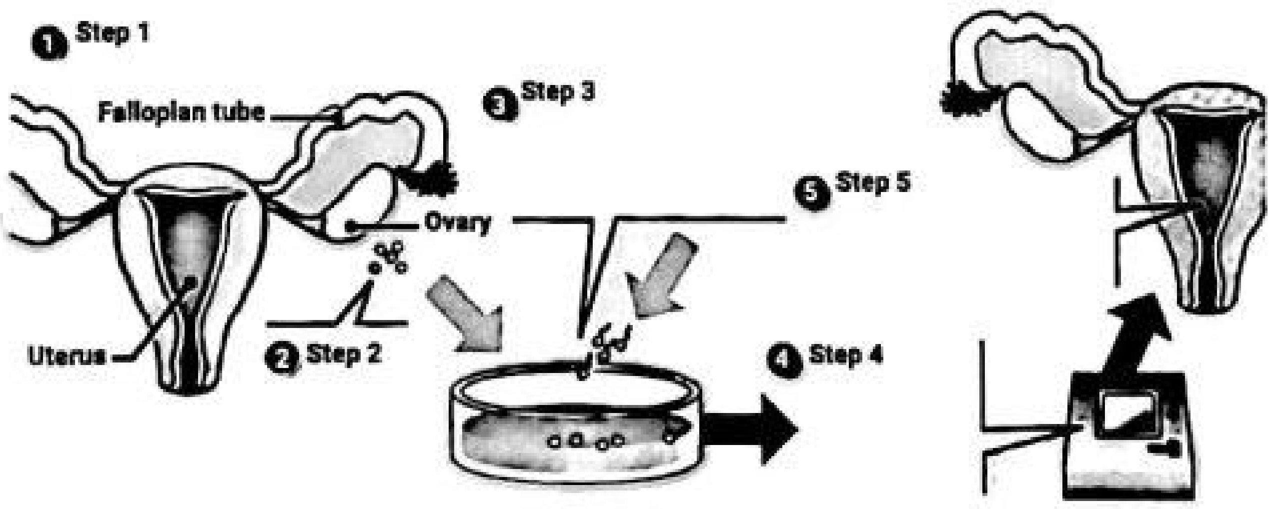
66 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The term sexually transmitted infection is generally preferred over sexually transmitted disease or venereal disease.
Reason (R):	There is often shame and stigma associated with these infections.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

67 The diagram shows the steps of IVF procedure. The number of correct statements is:

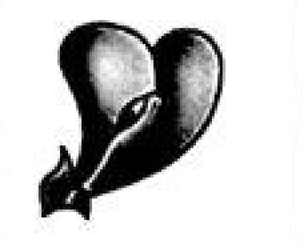
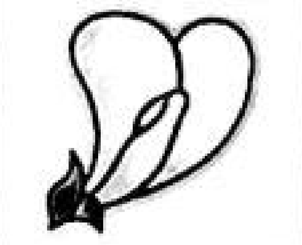
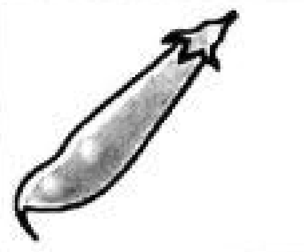
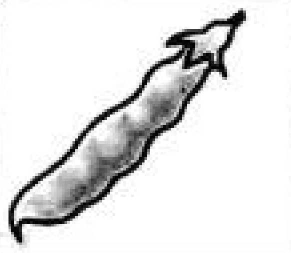
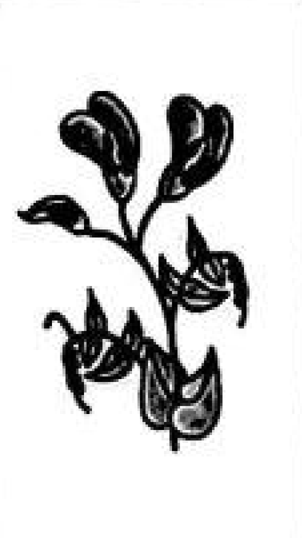
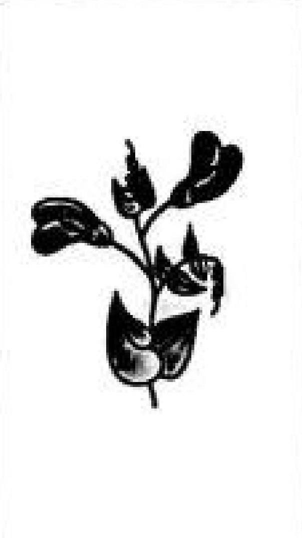
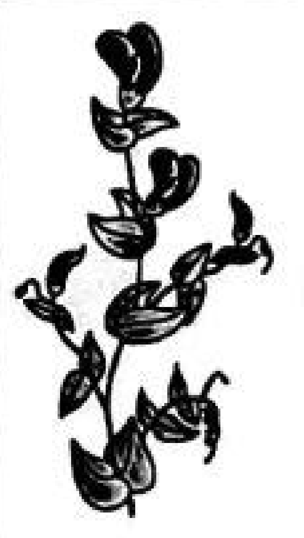
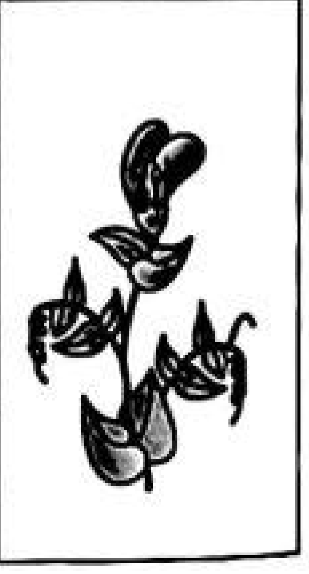


I.	Step 1 involves giving hormone treatments to the woman to stimulate egg production.
II.	Step 2 involves taking a single egg from the woman's ovaries.
III.	Step 3 involves mixing the eggs with the man's sperms in a culture dish in a lab for them to become fertilised.
IV.	Step 4 involves placing the fertilised eggs, or embryos, in an incubator for 48 hours.
V.	Step 5 involves implanting the embryos in the woman's uterus or freezing them for future implanting.

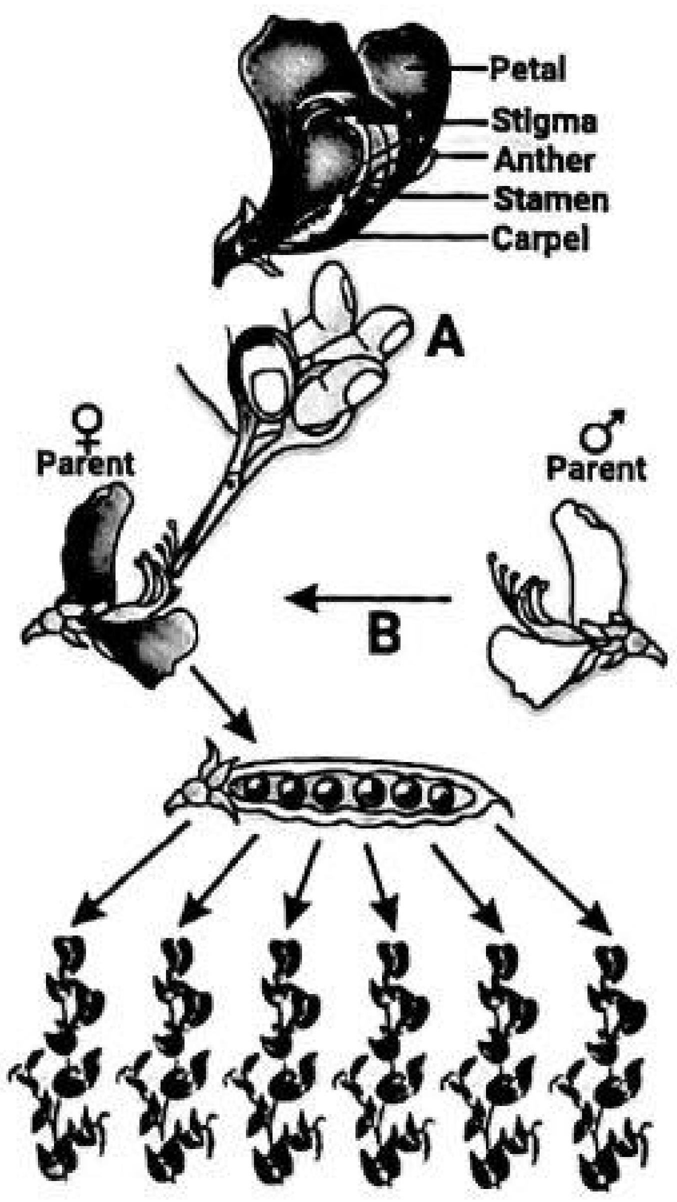
1.	2	2.	3
3.	4	4.	5

PRINCIPLES OF INHERITANCE AND VARIATION

68 Identify the incorrect match:

1. Flower Colour		2. Pod Shape	
Dominant	Recessive	Dominant	Recessive
			
3. Flower Position		4. Stem Height	
Dominant	Recessive	Dominant	Recessive
			

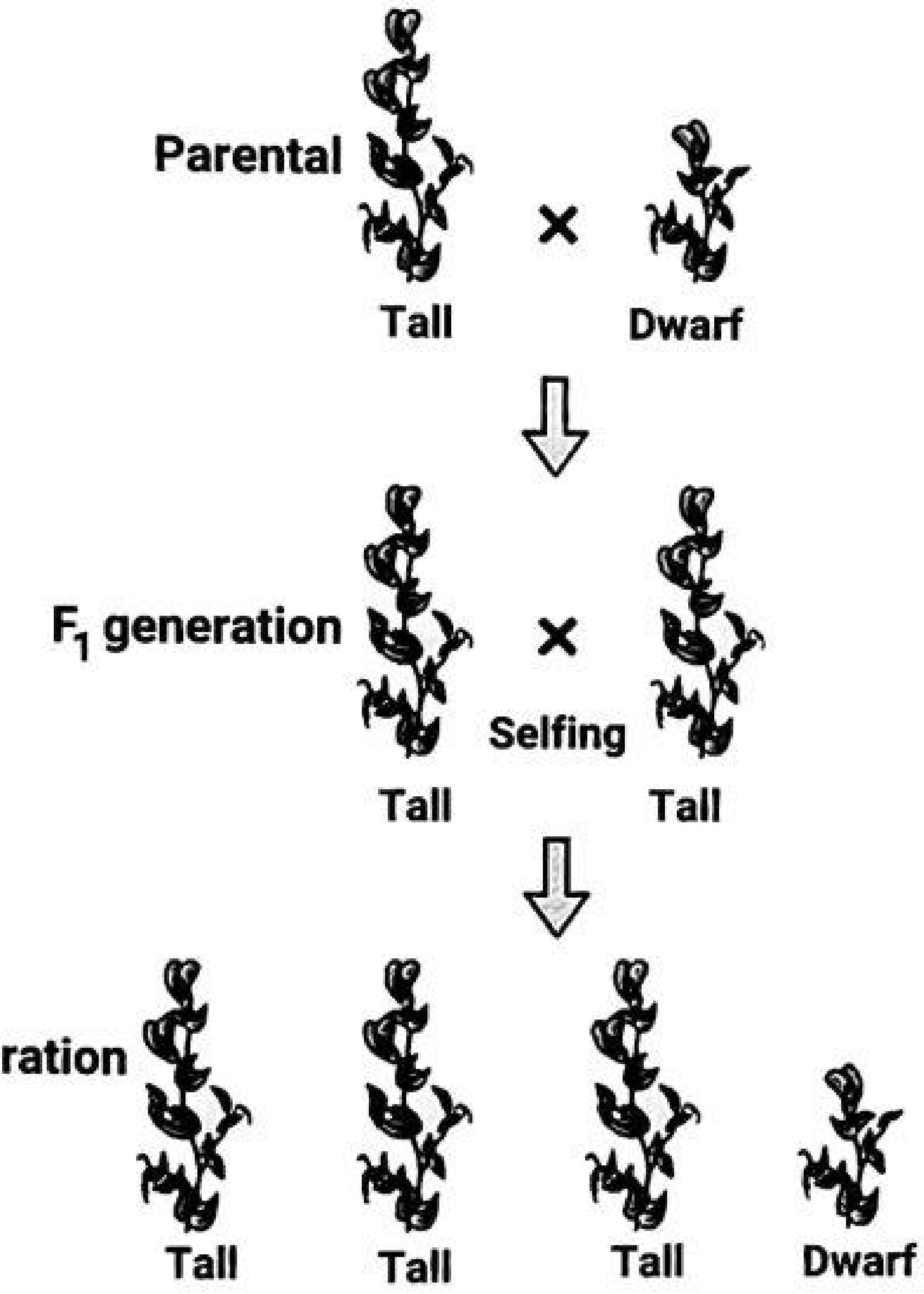
69 The given diagram shows the steps in making a cross in Pea.



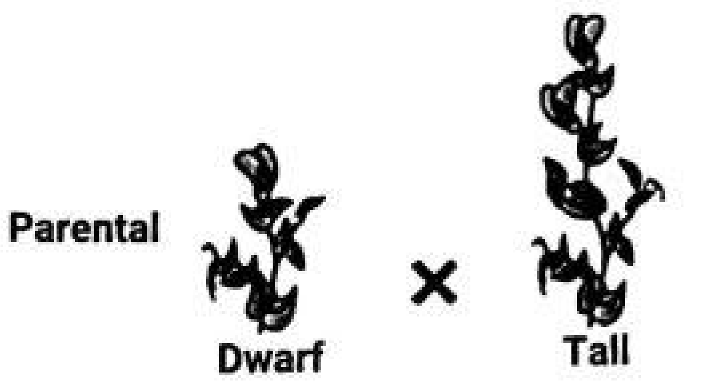
Statement I:	A is Emasculation where the anthers are removed only after maturity.
Statement II:	B is Pollination and it should be followed by bagging the flowers in the female parent.

1. **Statement I** is correct, **Statement II** is correct.
2. **Statement I** is incorrect, **Statement II** is correct.
3. **Statement I** is correct, **Statement II** is incorrect.
4. **Statement I** is incorrect, **Statement II** is incorrect.

70 The figure shows a diagrammatic representation of a monohybrid cross.

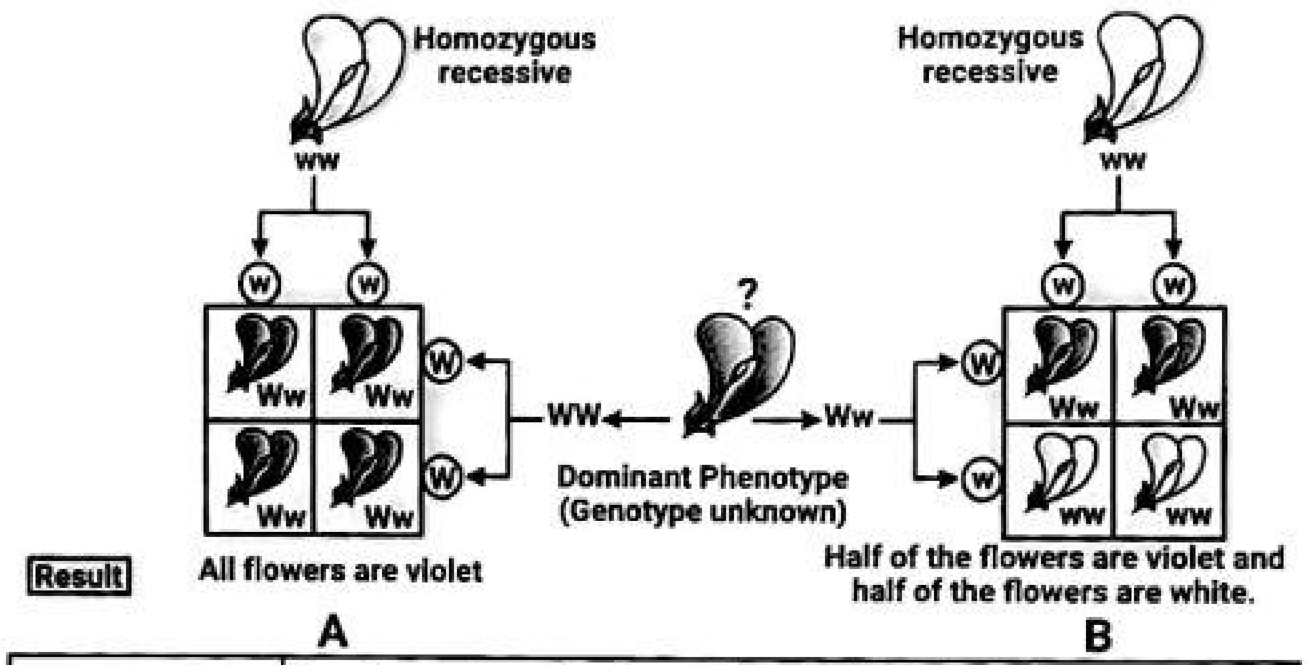

Parental
Tall
×
Dwarf
F_1 generation
Tall
×
Selfing
Tall
F_2 generation
Tall
Tall
Tall
Dwarf

If the conditions of the parental were to be different as given below, what would be the expected result of the cross?


Parental
Dwarf
×
Tall

1.	The results will be the same in F_1 generation but will be different in F_2 generation.
2.	The results will be different in F_1 generation but will be same in F_2 generation.
3.	The results will be the same in both F_1 generation and F_2 generation.
4.	The results will be different in both F_1 generation and F_2 generation.

71 The figure shows the diagrammatic representation of a test cross. Based on the results shown, what would be true?


Homozygous recessive
ww
w
w
Ww
Ww
Ww
Ww
w
w
Homozygous recessive
ww
w
w
?
WW
Ww
Dominant Phenotype (Genotype unknown)
W
w
Ww
Ww
ww
ww
Result
All flowers are violet
Half of the flowers are violet and half of the flowers are white.
A
B

Statement I:	In situation A, the plant with the dominant phenotype [genotype unknown] must be homozygous dominant.
Statement II:	In situation B, the plant with the dominant phenotype [genotype unknown] must be heterozygous.

1. Only **Statement I**
2. Only **Statement II**
3. Both **Statement I** and **Statement II**
4. Neither **Statement I** nor **Statement II**

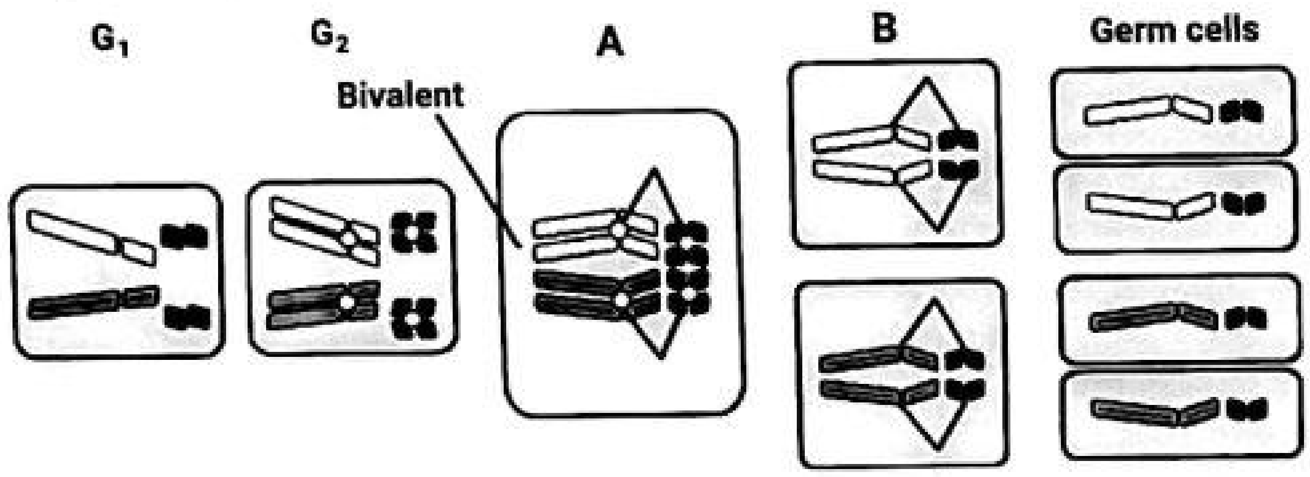
72 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Dominance is not an autonomous feature of a gene or the product that it has information for.
Reason (R):	The frequency of a gene or an allele in a population is ultimately decided by factors such as natural selection.

In the light of the above statements, choose the most appropriate answer from the options given below :

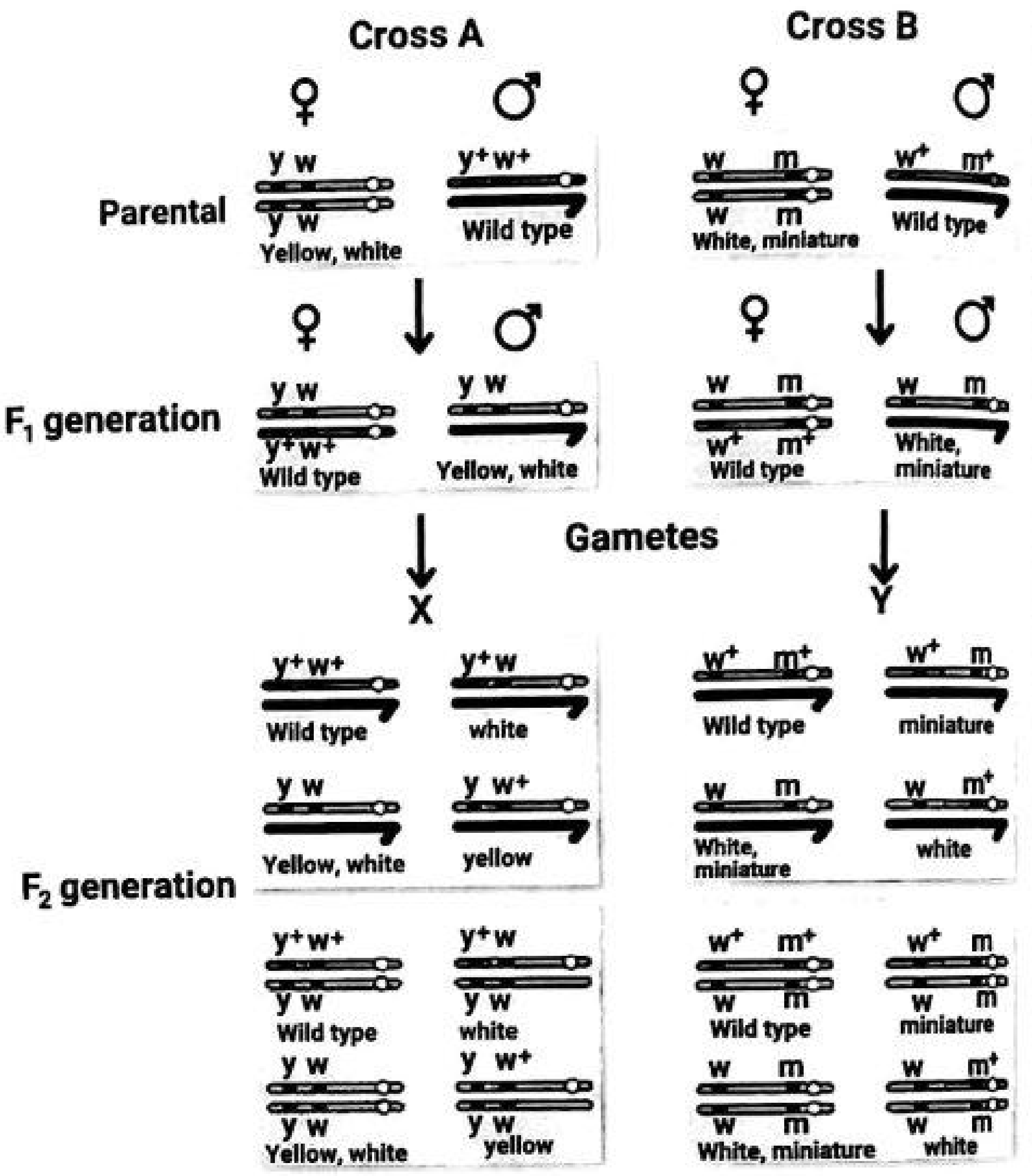
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

73 The given figure shows meiosis and germ cell formation in a cell with four chromosomes and segregation when germ cells are formed. A and B would, respectively, be:


G₁
G₂
Bivalent
A
B
Germ cells

1. Anaphase I and Metaphase II
2. Anaphase I and Anaphase II
3. Metaphase I and Anaphase II
4. Metaphase I and Metaphase II

74 The figure shows the results of two dihybrid crosses conducted by Morgan where X and Y, respectively, are the percentages of parental and recombinants forms in Cross A and Cross B. Identify the correct statements:


Cross A
Cross B
♀
♂
Parental
y w
y w
Yellow, white
y⁺w⁺
Wild type
w m
w m
White, miniature
w⁺ m⁺
Wild type
F₁ generation
y w
y⁺w⁺
Wild type
y w
Yellow, white
w m
w⁺ m⁺
Wild type
w m
White, miniature
Gametes
X
Y
F₂ generation
y⁺w⁺
Wild type
y⁺w
white
y w
Yellow, white
y w⁺
yellow
w⁺ m⁺
Wild type
w⁺ m
miniature
w m
White, miniature
w m⁺
white

Statement I:	X will be parental types (98.7%) and recombinant types (1.3%); Y will be parental types (62.8%) and recombinant types (37.2%)
Statement II:	The strength of linkage is inversely proportional to the distance between the genes located on the same chromosome.

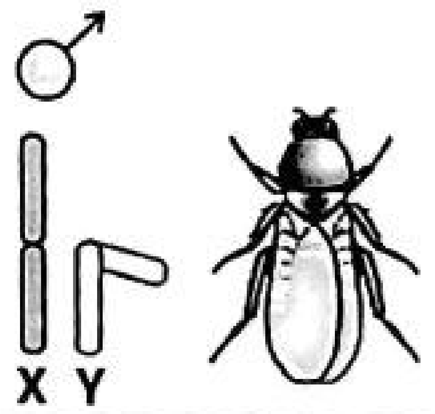
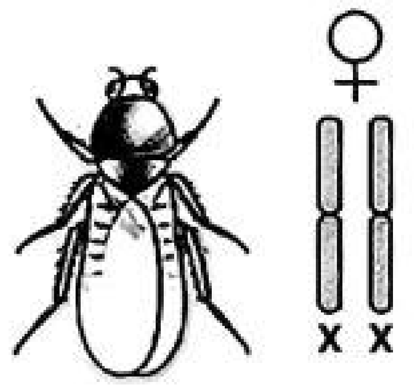
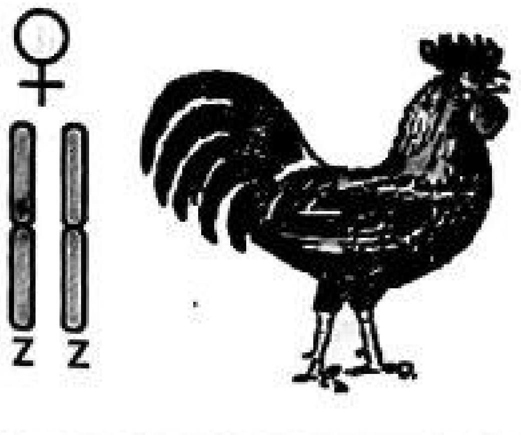
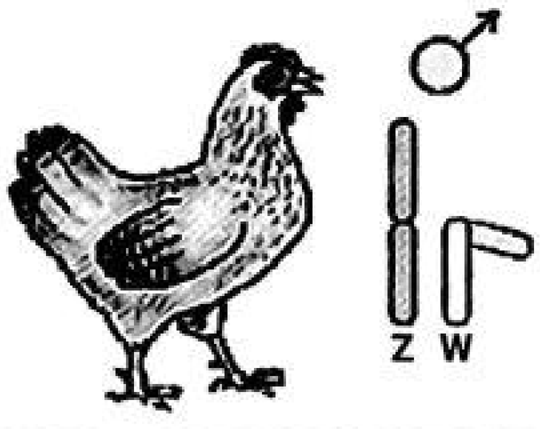
1. Only **Statement I**
2. Only **Statement II**
3. Both **Statement I** and **Statement II**
4. Neither **Statement I** nor **Statement II**

75 Consider the given statements:

I:	Where a single gene can exhibit multiple phenotypic expressions, such a gene is called a pleiotropic gene.
II:	The underlying mechanism of pleiotropy in most cases is the effect of a gene on metabolic pathways which contribute towards different phenotypes.
III:	Phenylketonuria is caused by a defect in the gene that codes for the enzyme phenylalanine hydroxylase and manifests itself through phenotypic expression characterised by mental retardation and a reduction in hair and skin pigmentation.

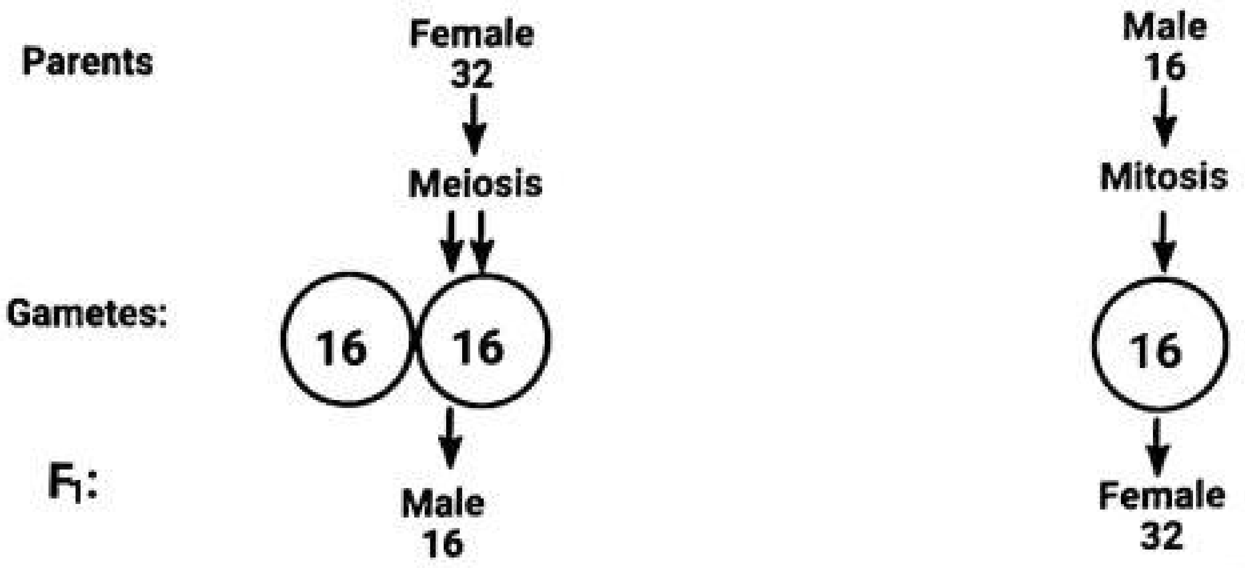
1.	**Statement I** is correct, **Statement II** is correct, **Statement III** is incorrect.
2.	**Statement I** is incorrect, **Statement II** is correct, **Statement III** is incorrect.
3.	**Statement I** is correct, **Statement II** is incorrect, **Statement III** is correct.
4.	**Statement I** is correct, **Statement II** is correct, **Statement III** is correct.

76 The following figure shows the determination of sex by chromosomal differences. Which of the following is/are correctly matched?

A		
B		

1.	Only A	2.	Only B
3.	Both A and B	4.	Neither A nor B

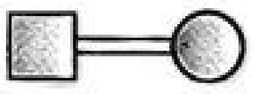
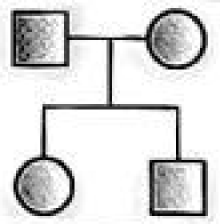
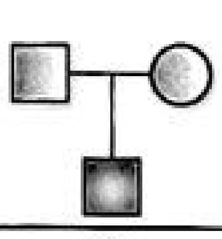
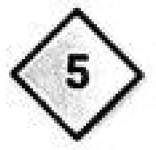
77 The figure shows the mechanism of sex determination in a honey bee. How many of the given statements will be true for the mechanism of sex determination in honey bees?



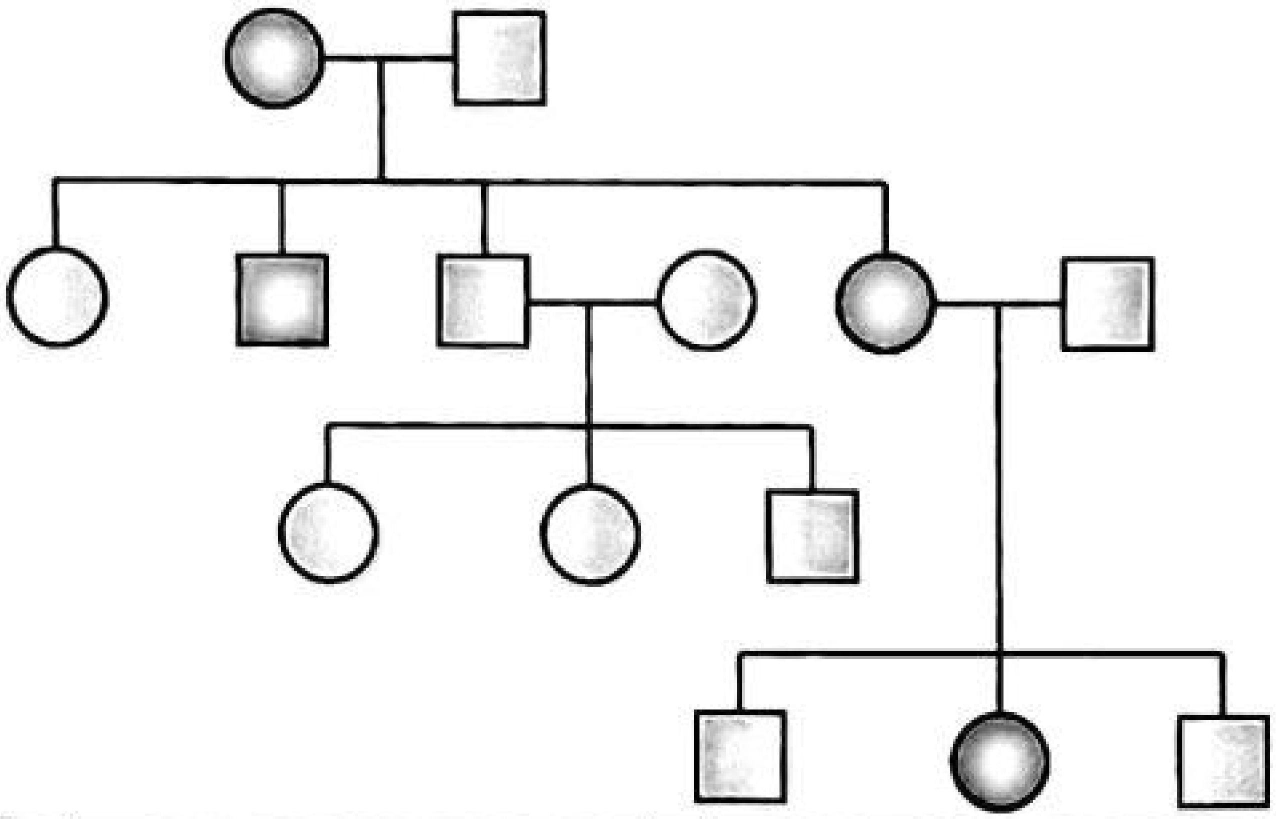
I.	The sex determination in honey bee is based on the number of sets of chromosomes an individual receives.
II.	An offspring formed from the union of a sperm and an egg develops as a female (queen or worker), and an unfertilised egg develops as a male (drone) by means of parthenogenesis.
III.	The males have double the number of chromosomes than that of a female, therefore, the females are haploid having 16 chromosomes and the males are diploid, i.e., having 32 chromosomes.
IV.	This is called a haplodiploid sex-determination system.
V.	The males produce sperms by mitosis, they do not have a father and thus cannot have sons, but have a grandfather and can have grandsons.

1.	2	2.	3
3.	4	4.	5

78 Identify the incorrectly matched pair:

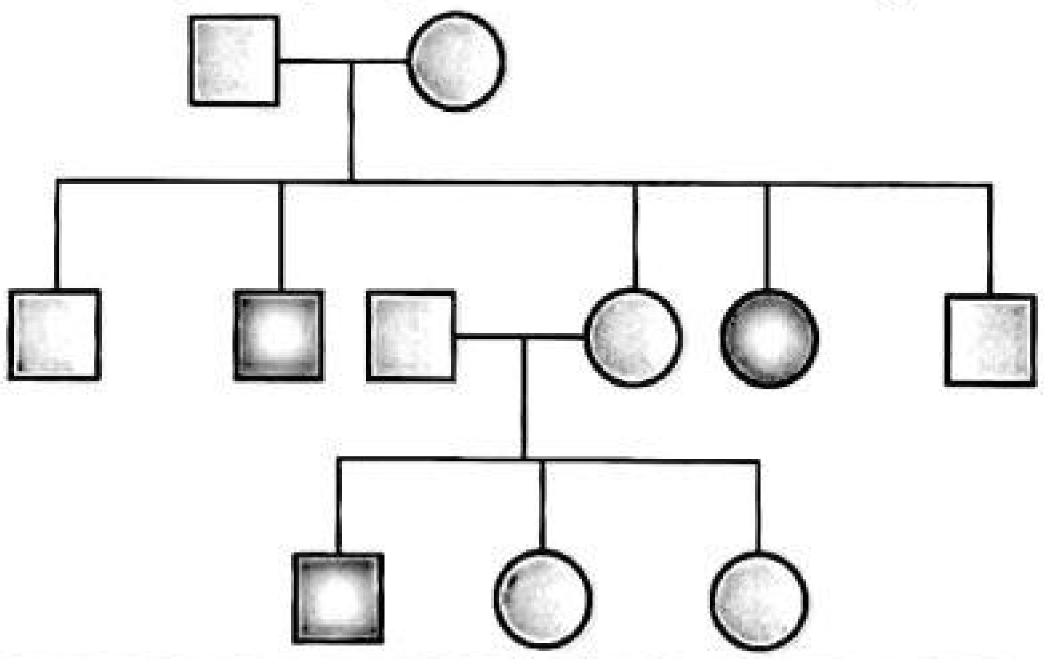
	Pedigree Symbol	**Meaning**
1.		Mating between relatives (consanguineous mating)
2.		Parents above and children below(in order of birth – left to right)
3.		Parents with a male child affected with the disease
4.		Five affected offspring

79 The mode of inheritance of the Mendelian disorder shown in the given pedigree chart is most likely:



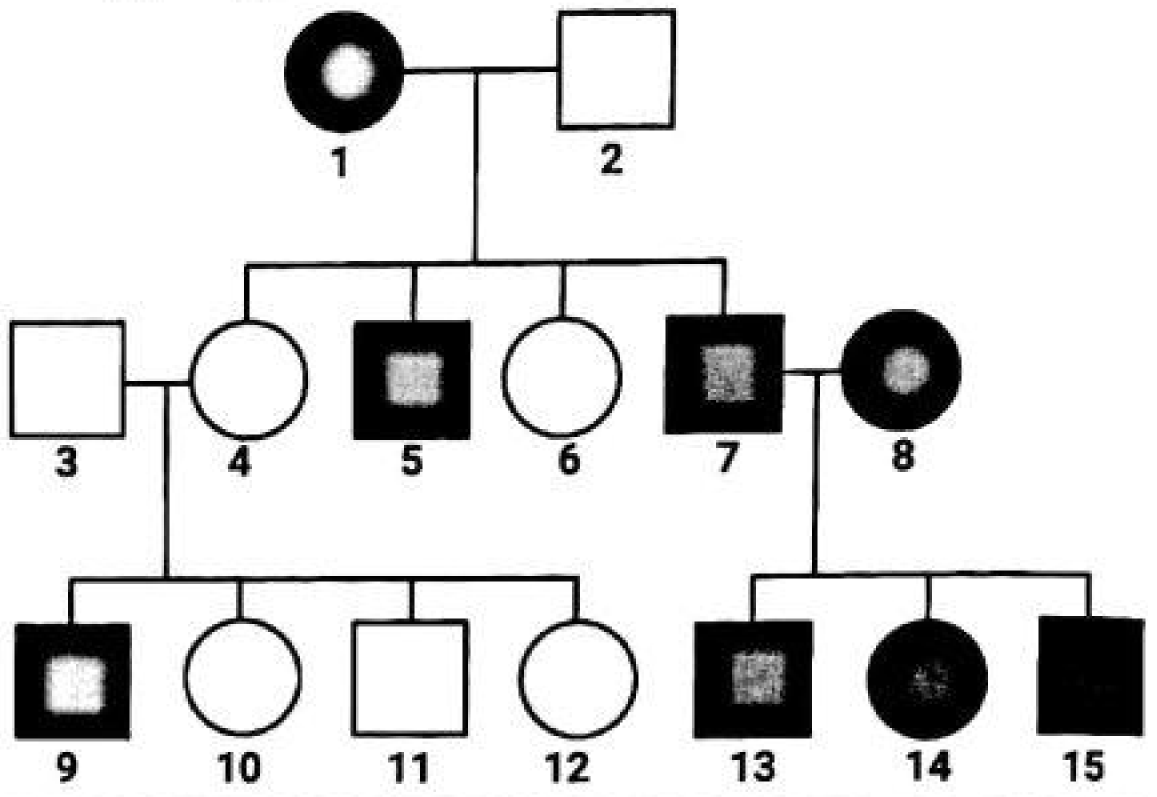
1.	Autosomal recessive	2.	Autosomal dominant
3.	Sex-linked recessive	4.	Sex-linked dominant

80 The mode of inheritance of the Mendelian disorder shown in the given pedigree chart is most likely:



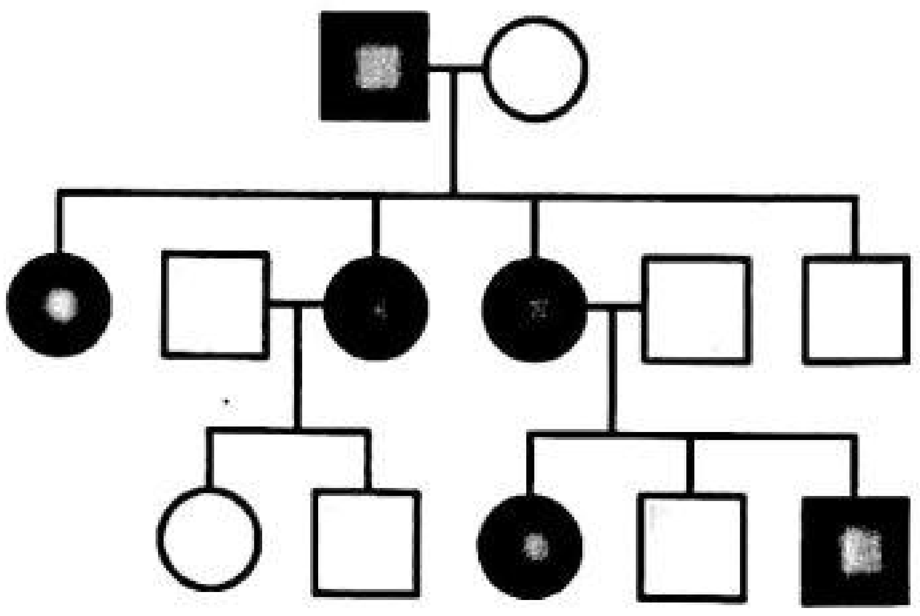
1.	Autosomal recessive	2.	Autosomal dominant
3.	Sex-linked recessive	4.	Sex-linked dominant

81 The mode of inheritance of the trait shown in the following pedigree is most likely:



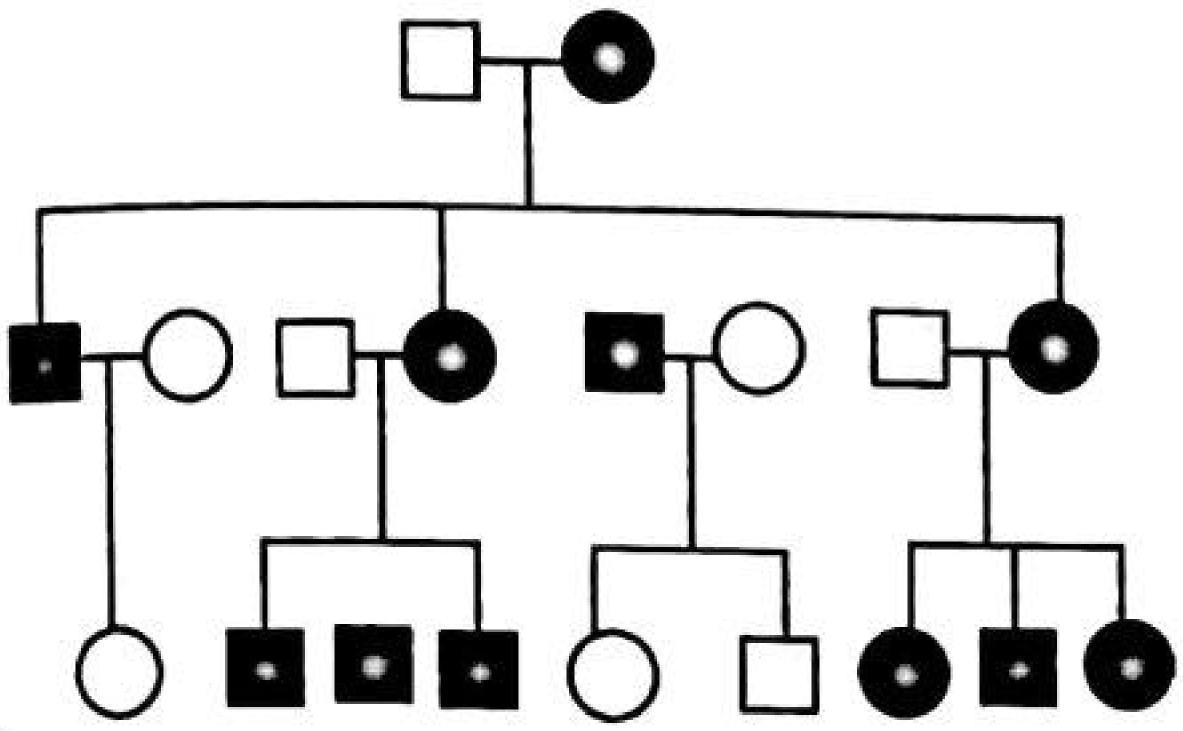
1.	Autosomal recessive	2.	Sex-linked recessive
3.	Autosomal dominant	4.	Sex-linked dominant

82 The mode of inheritance of the trait shown in the given pedigree is MOST likely:



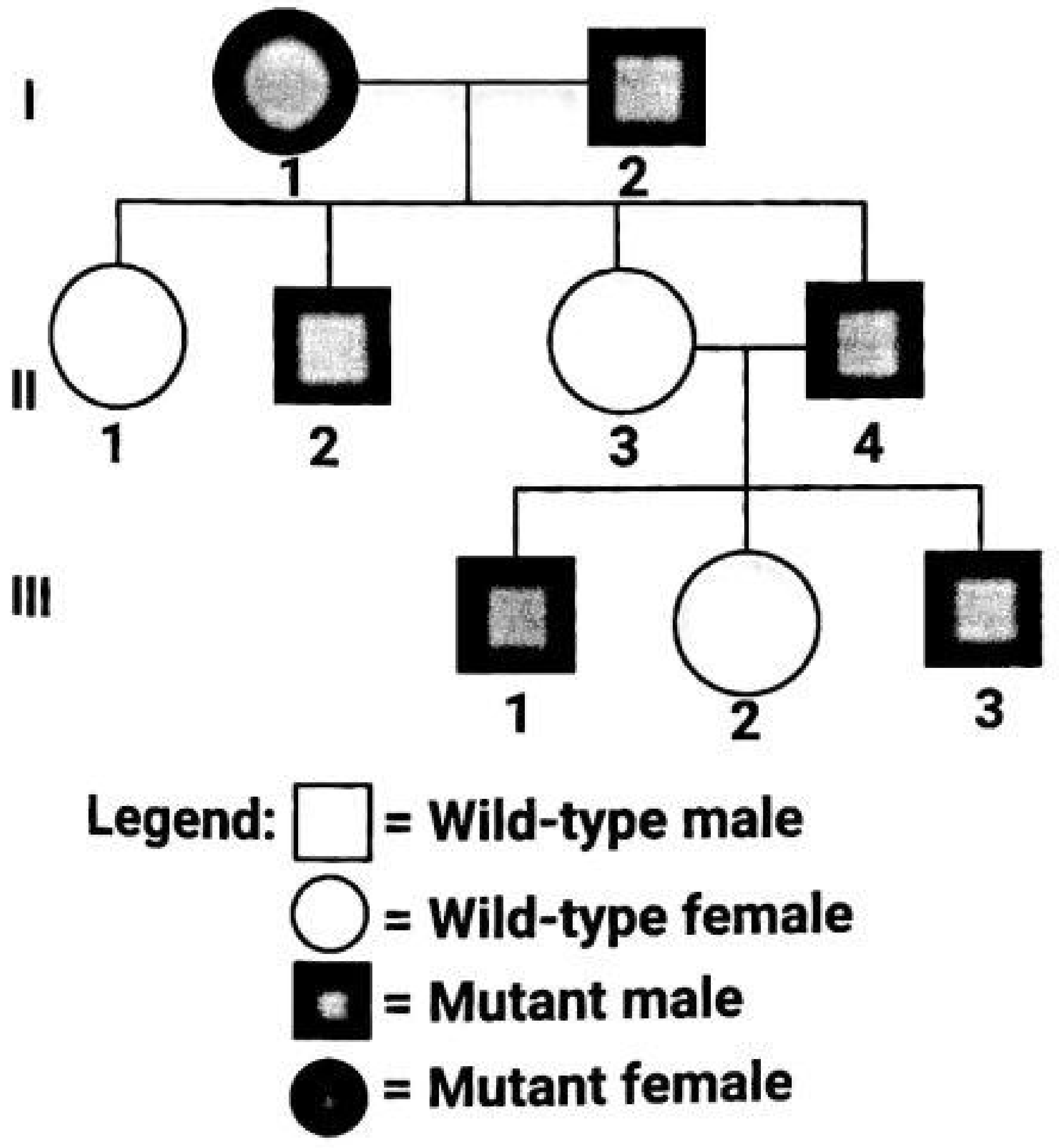
1.	X-linked recessive	2.	Autosomal recessive
3.	X-linked dominant	4.	Autosomal dominant

83 The inheritance of the trait shown in the given pedigree most likely is:



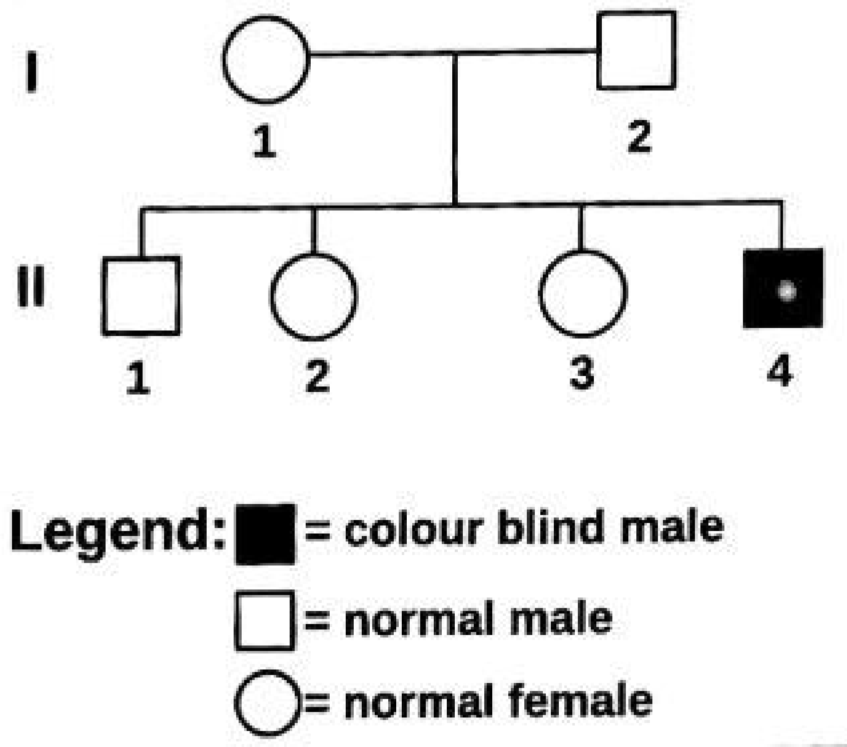
1.	Autosomal recessive	2.	Autosomal dominant
3.	Sex-linked recessive	4.	Sex-linked dominant

84 In the pedigree shown, mating between individuals III 2 and III 3 results in a progeny, which is an affected female. Based on this information, most likely this disorder is:


I
II
III
1
2
1
2
3
4
1
2
3
Legend: □ = Wild-type male
○ = Wild-type female
■ = Mutant male
● = Mutant female

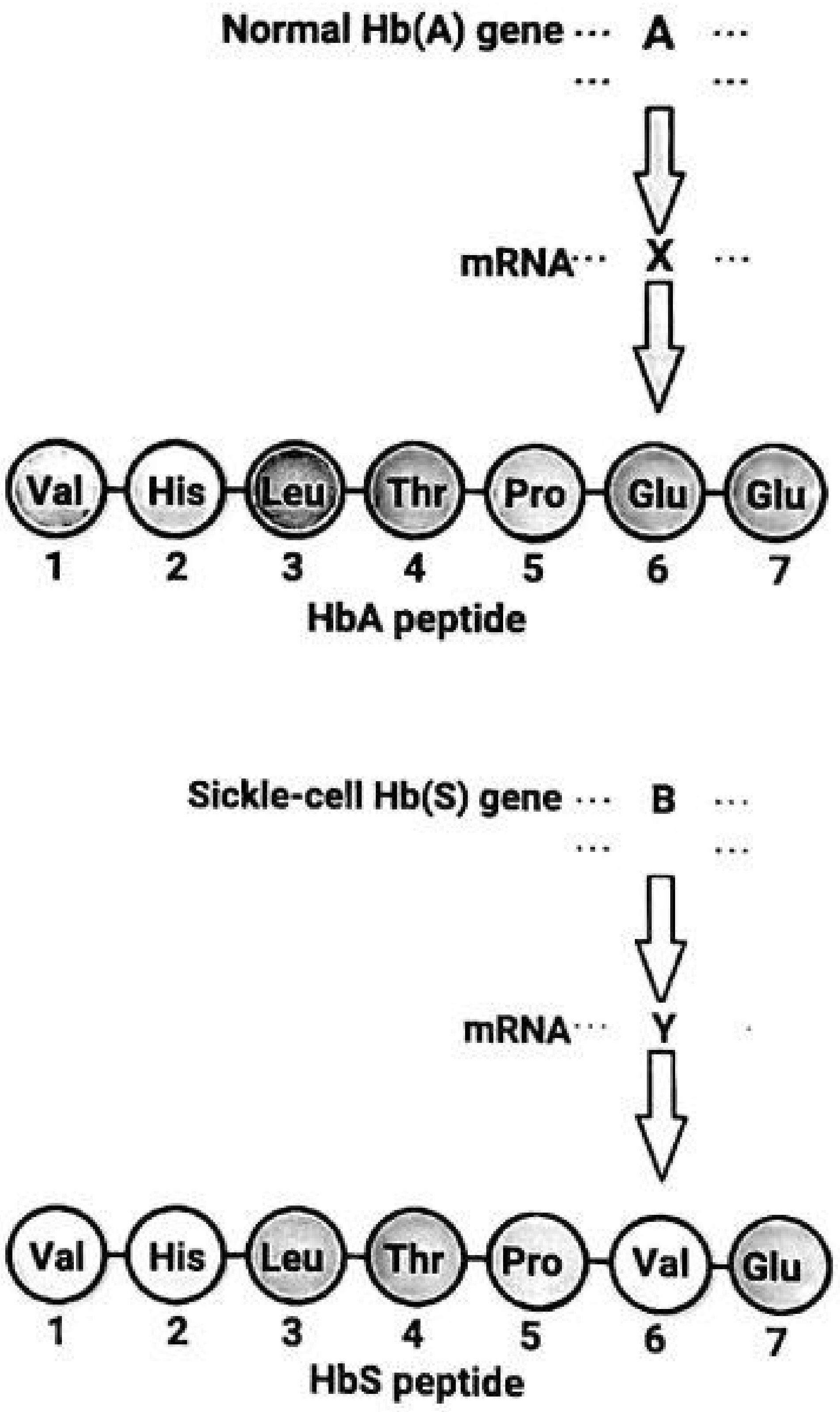
1.	Holandric	2.	Sex-linked dominant
3.	Sex-linked recessive	4.	Either 1 or 2

85 The pedigree shows the inheritance of red-green color blindness in a family. If II 3 marries a color-blind man, what is the probability that her first child will be normal?


I
II
1
2
1
2
3
4
Legend: ■ = colour blind male
□ = normal male
○ = normal female

1.	¼	2.	½
3.	2/3	4.	¾

86 The figure shows the point mutation responsible for the pathogenesis of sickle cell anaemia. Identify the correct statements.


Normal Hb(A) gene ··· A ···
··· ···
mRNA··· X ···
Val
His
Leu
Thr
Pro
Glu
Glu
1
2
3
4
5
6
7
HbA peptide
Sickle-cell Hb(S) gene ··· B ···
··· ···
mRNA··· Y
Val
His
Leu
Thr
Pro
Val
Glu
1
2
3
4
5
6
7
HbS peptide

Statement I:	The peptide chain of the haemoglobin molecule that gets mutated leading to the disease is the alpha chain.
Statement II:	The mRNA codon X can be GAG and the mRNA codon Y can be GUG.

1. Only **Statement I**
2. Only **Statement II**
3. Both **Statement I** and **Statement II**
4. Neither **Statement I** nor **Statement II**

87 Regarding thalassemia:

Statement I:	It is an autosome-linked recessive blood disease transmitted from parents to the offspring when both partners are the unaffected carriers for the gene (or heterozygous).
Statement II:	The defect could be due to either mutation or deletion which ultimately results in a reduced rate of synthesis of one of the globin chains (α and β chains) that make up haemoglobin.

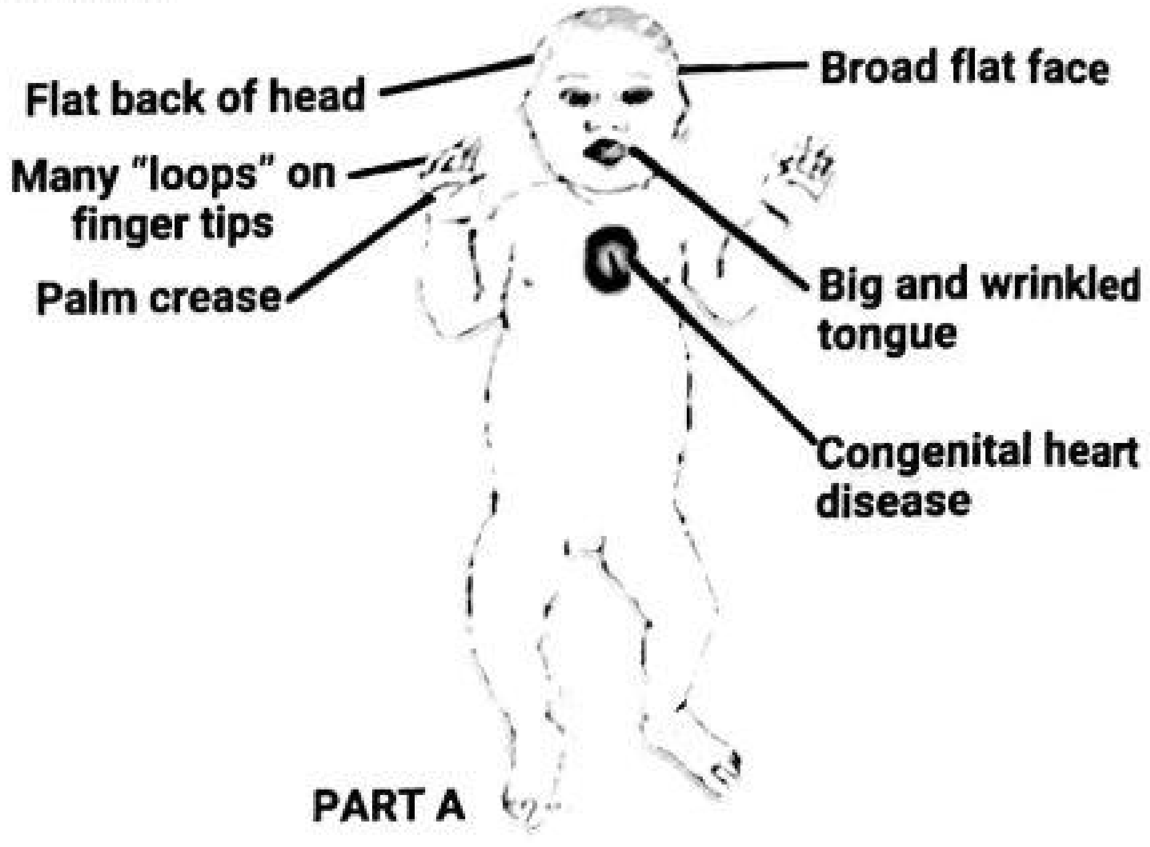
1. **Statement I** is correct, **Statement II** is correct.
2. **Statement I** is incorrect, **Statement II** is correct.
3. **Statement I** is correct, **Statement II** is incorrect.
4. **Statement I** is incorrect, **Statement II** is incorrect.

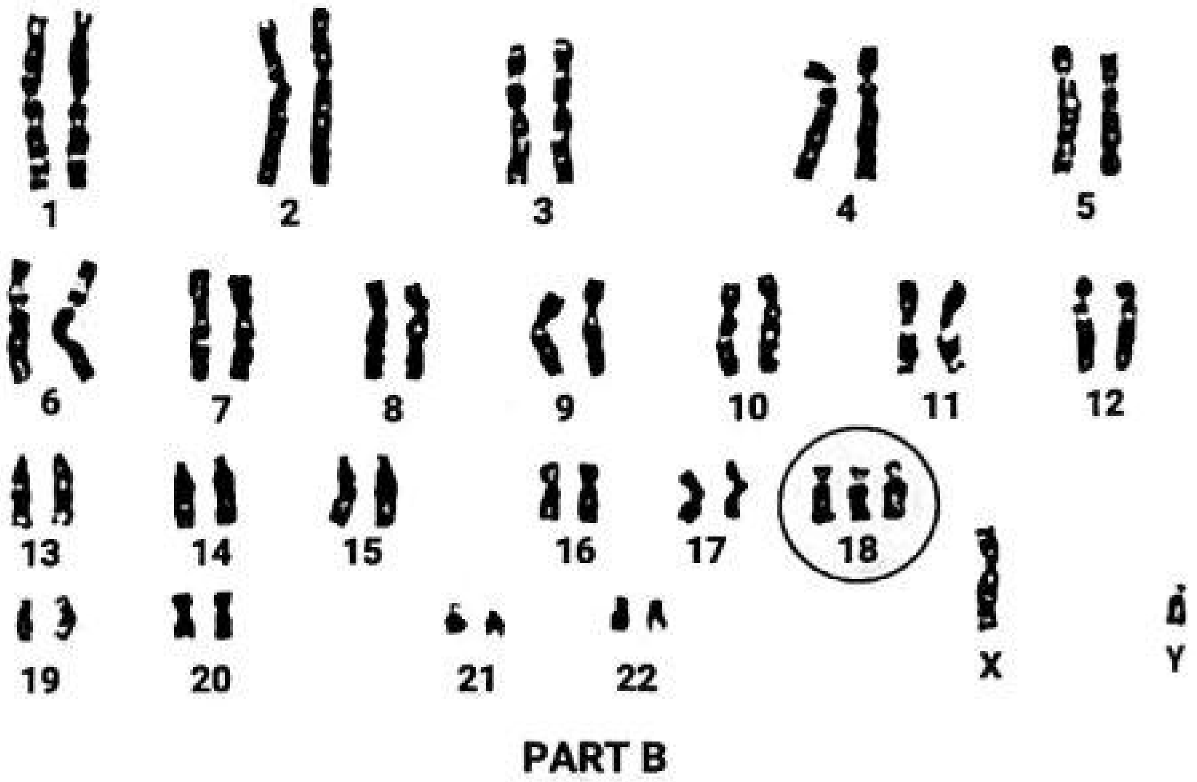
88 Thalassemia can be classified according to which chain of the haemoglobin molecule is affected.

Statement I:	α Thalassemia is controlled by a single gene HBB on chromosome 11 of each parent and occurs due to mutation of one or both the genes.
Statement II:	β Thalassemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16 of each parent.

1. **Statement I** is correct, **Statement II** is correct.
2. **Statement I** is incorrect, **Statement II** is correct.
3. **Statement I** is correct, **Statement II** is incorrect.
4. **Statement I** is incorrect, **Statement II** is incorrect.

89 Study the given figures and select the correct statements.

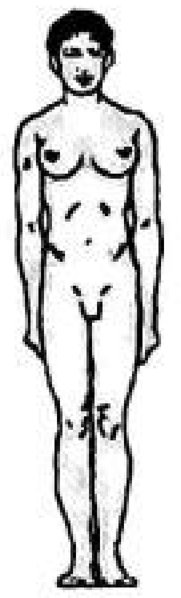
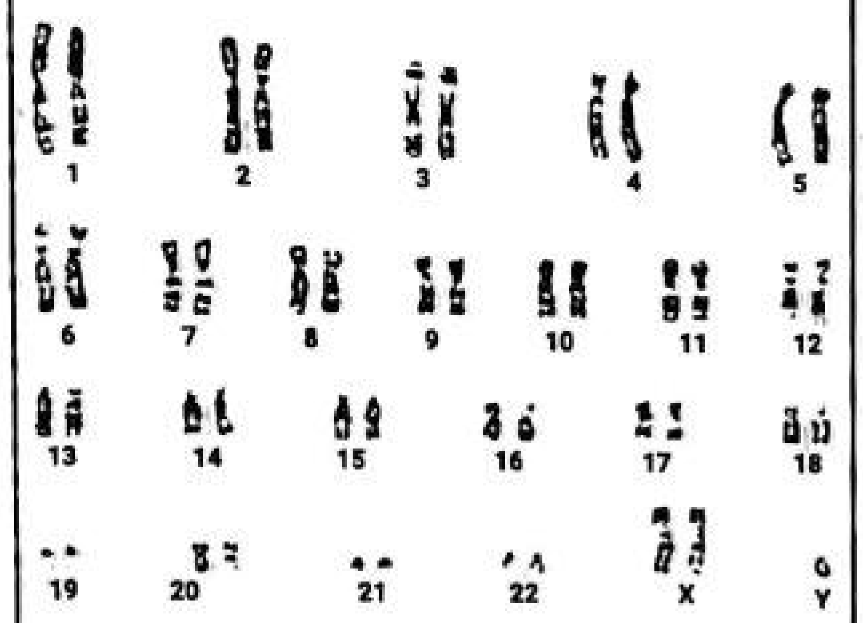
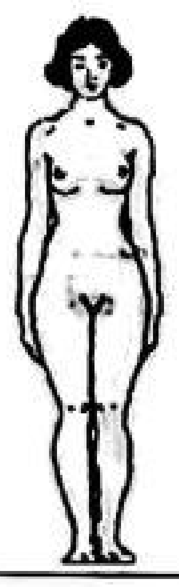
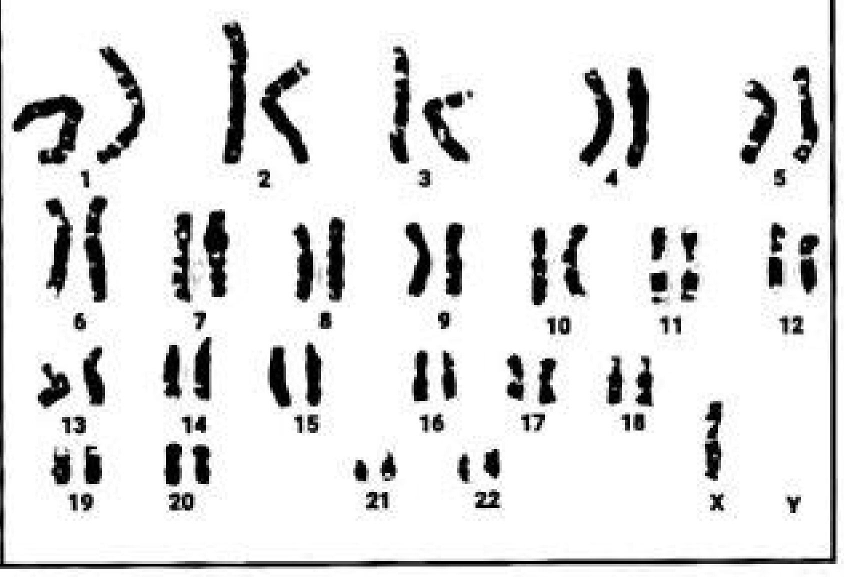




Statement I:	Part A shows the common clinical features of Down's syndrome.
Statement II:	Part B shows the characteristic karyotype of Down's Syndrome.

1. Only **Statement I**
2. Only **Statement II**
3. Both **Statement I** and **Statement II**
4. Neither **Statement I** nor **Statement II**

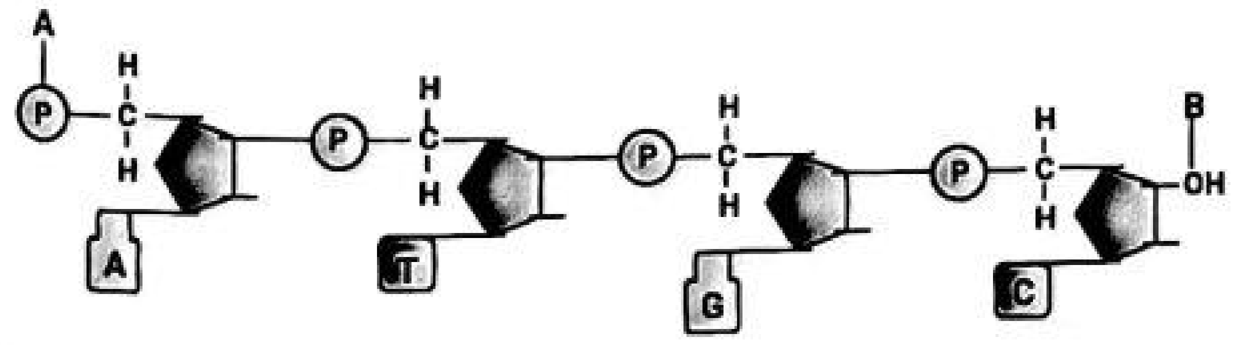
90 Identify the incorrectly matched pair:

	Chromosomal disorder	Karyotype
A		
B		

1.	Only A	2.	Only B
3.	Both A and B	4.	Neither A nor B

MOLECULAR BASIS OF INHERITANCE

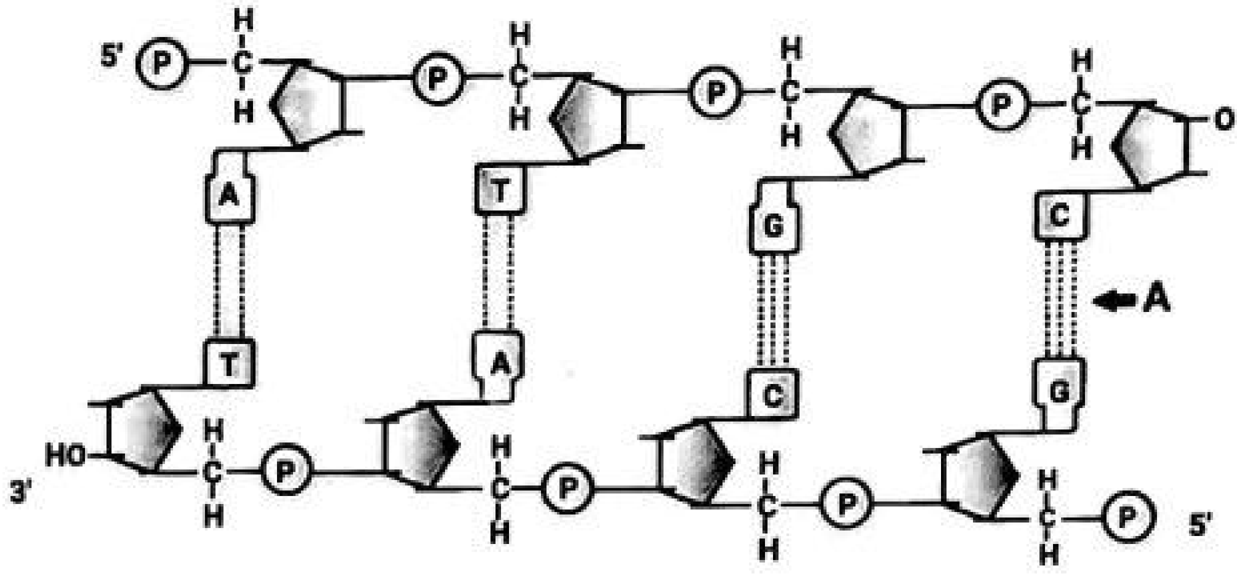
91 The figure shows a polynucleotide chain.



Statement I:	A is the 5' end of the polynucleotide chain and B is the 3' end of the polynucleotide chain.
Statement II:	The nitrogenous bases linked to sugar moiety project from the backbone.

1. **Statement I** is correct, **Statement II** is incorrect
2. **Statement I** is incorrect, **Statement II** is correct
3. **Statement I** is incorrect, **Statement II** is incorrect
4. **Statement I** is correct, **Statement II** is correct

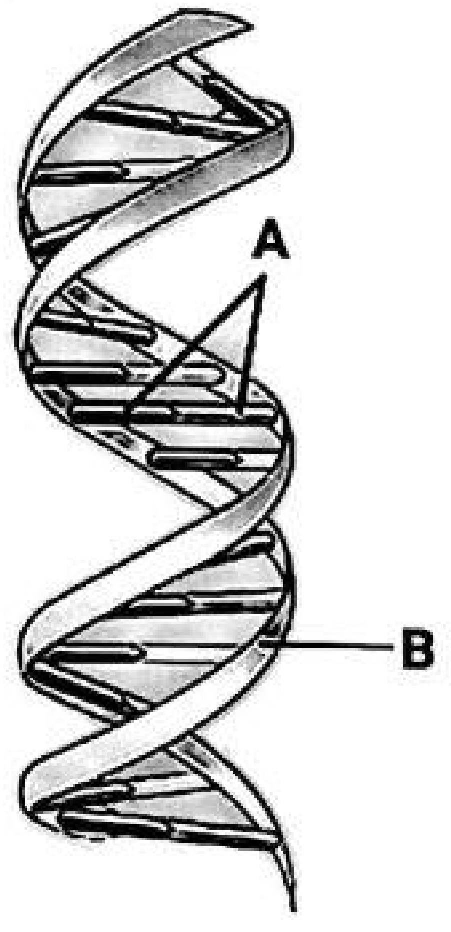
92 Study the structure of double-stranded nucleotide chain given below and select the correct statements:



Statement I:	A shows the hydrogen bonds where a triple bond links Guanine and Cytosine and a double bond links Adenine and Thymine.
Statement II:	If Adenine in such a dsDNA molecule is found to be 20 %, the amount of Cytosine in this ds DNA molecule is expected to be 20 %.

1. **Statement I** is correct, **Statement II** is incorrect
2. **Statement I** is incorrect, **Statement II** is correct
3. **Statement I** is incorrect, **Statement II** is incorrect
4. **Statement I** is correct, **Statement II** is correct

93 The diagram shows the DNA double helix. What will be true for the helix?



I:	A represents a base pair where the plane of one base pair stacks over the other in the double helix giving the helix more stability in addition to hydrogen bonds.
II:	There are 10 base pairs in one complete turn of B-dNA.
III:	B is the backbone constituted by sugar-phosphate.
IV:	The two strands are parallel-oriented in the same direction with respect to each other.
V:	The diameter is uniform, around 2.0nm.

1.	Only **I, II** and **III**	2.	Only **II, III, IV** and **V**
3.	Only **I, II, III** and **V**	4.	**I, II, III, IV** and **V**

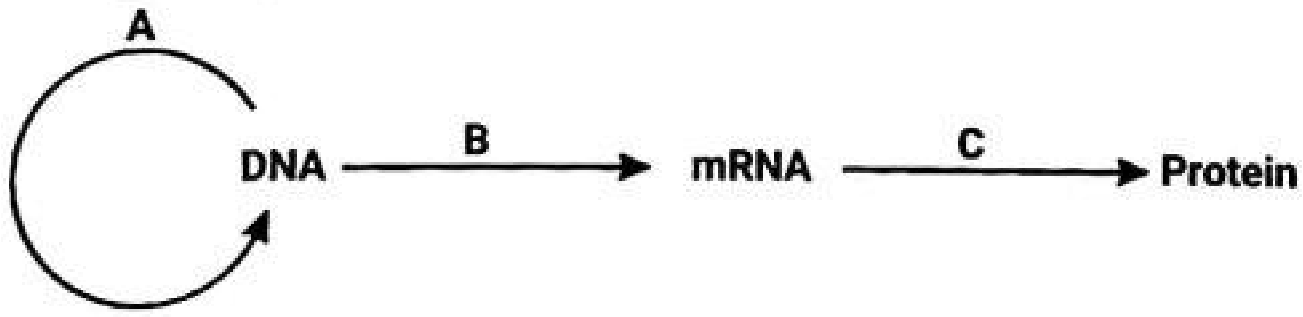
94 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The distance between the two strands of the DNA helix is approximately uniform.
Reason (R):	Base pairing is complementary, where a purine always base pairs with a pyrimidine and a pyrimidine always base pairs with a purine.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

95 The central dogma of molecular biology is an explanation of the flow of genetic information within a biological system.



Statement I:	A is 'replication' where DNA is replicated in a semi-conservative manner.
Statement II:	B is 'transcription' and is so called because the language of RNA is only a slight variant of the language of the DNA.
Statement III:	C is 'translation' and is so called because the language of Protein is entirely different from the language of RNA.

1.	**Statement I** is correct, **Statement II** is incorrect, **Statement III** is incorrect
2.	**Statement I** is correct, **Statement II** is correct, **Statement III** is incorrect
3.	**Statement I** is correct, **Statement II** is correct, **Statement III** is correct
4.	**Statement I** is incorrect, **Statement II** is incorrect, **Statement III** is incorrect

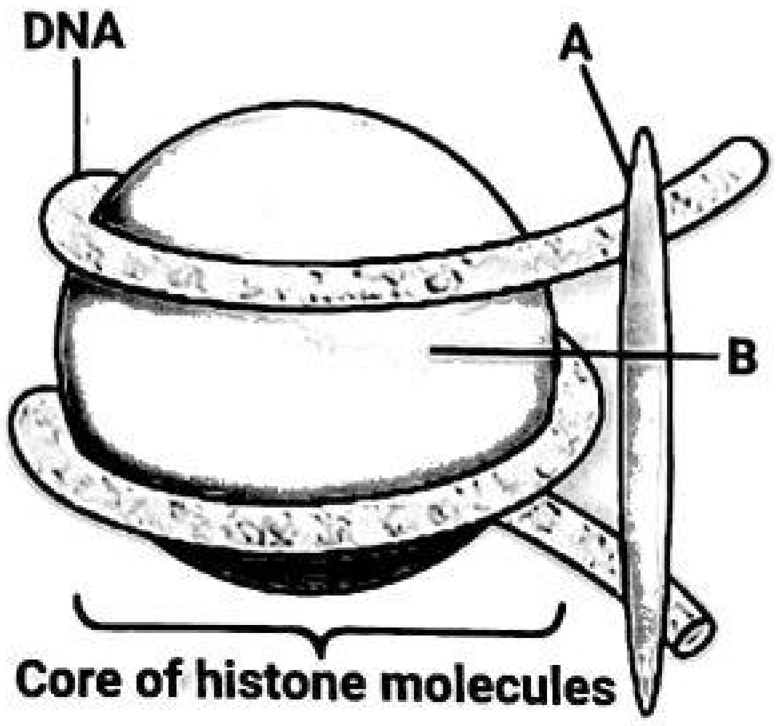
96 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	A set of positively charged and basic proteins are used in the packaging of Eukaryotic DNA.
Reason (R):	DNA molecule is acid and carries a negative charge.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

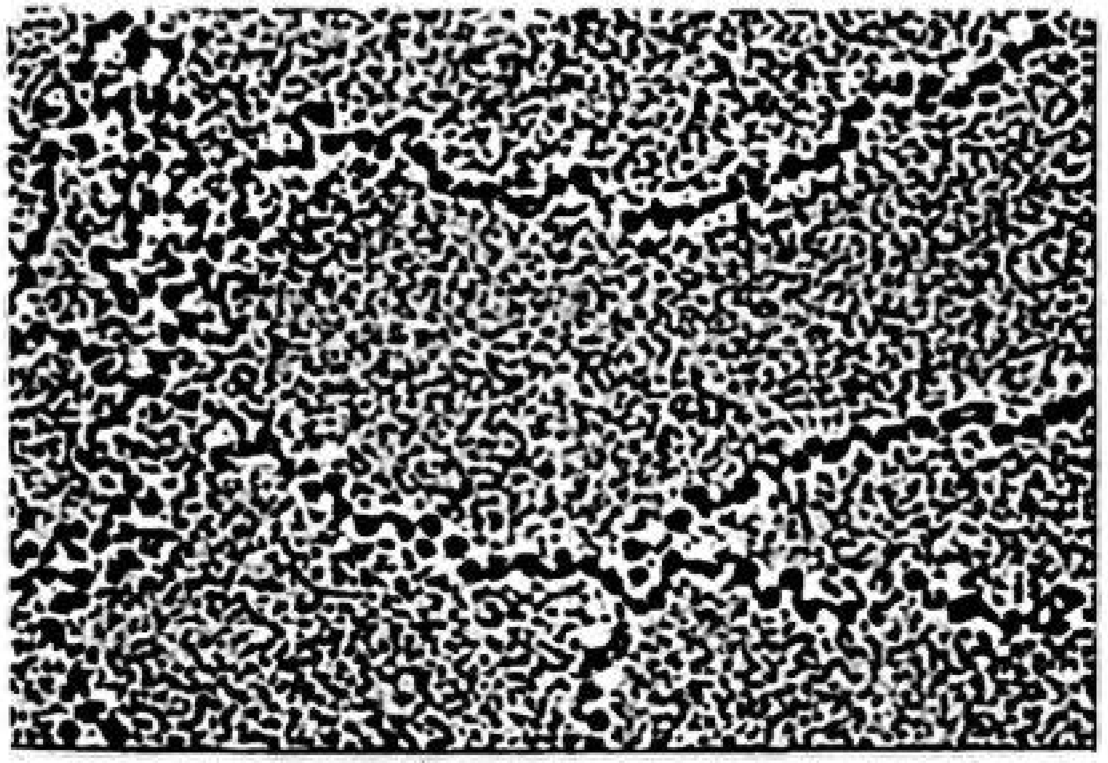
97 The structure of nucleosome is shown below:



I:	A is H1 histone.
II:	B is a tetramer made of histone proteins.

1. **Statement I** is correct, **Statement II** is incorrect.
2. **Statement I** is incorrect, **Statement II** is correct.
3. **Statement I** is incorrect, **Statement II** is incorrect.
4. **Statement I** is correct, **Statement II** is correct.

98 The given figure shows the Electron Microscope 'beads-on-string' structure of:



1.	Nucleosome	2.	Solenoid
3.	Filament	4.	Metaphase chromosome

99 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Euchromatin is said to transcriptionally active protein.
Reason (R):	Heterochromatin is said to be transcriptionally inactive.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	Both **(A)** and **(R)** are False.

100 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	S-strain of *Streptococcus pneumoniae* is virulent.
Reason (R):	Heat-killed S-strain *Streptococcus pneumoniae* injected into mice did not cause pneumonia and did not kill them.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	Both **(A)** and **(R)** are False.

101 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In Avery, Macleod, and McCarty's experiment, digestion of heat-killed lysate with proteases and RNases did not affect transformation but digestion with DNase did.
Reason (R):	DNase will hydrolyse all biomolecules in the lysate except DNA.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	Both **(A)** and **(R)** are False.

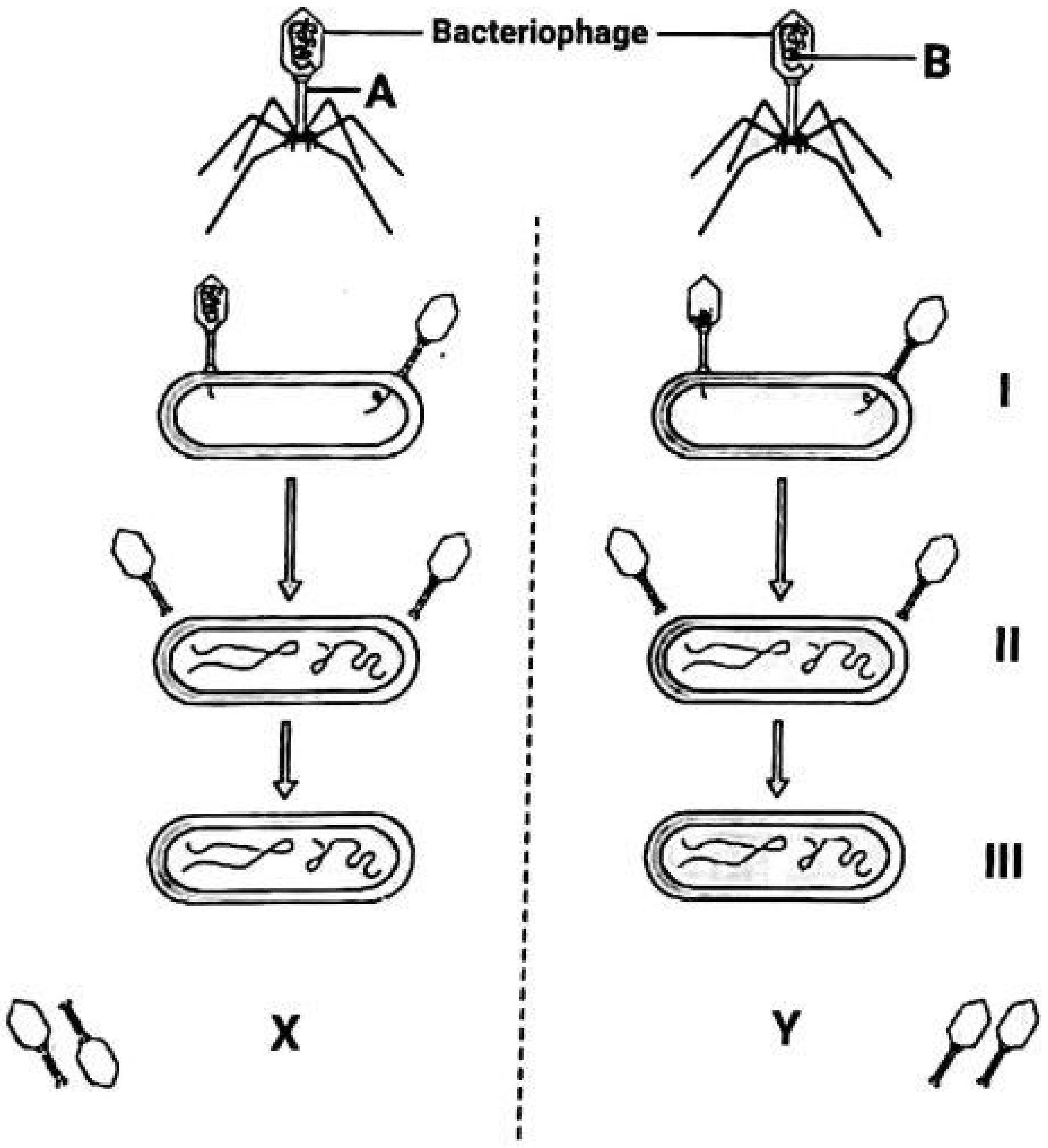
102 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Even after the results of Avery, Macleod, and McCarty's experiment, not all biologists were convinced that DNA is hereditary material.
Reason (R):	Proteins were conclusively proved to be the genetic material for almost all living organisms.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

103 Study the illustration of the basic steps of the Hershey-Chase experiment and select the correct statements from the given experiments:



I:	'A' shows that viruses grown on radioactive sulfur contained radioactive protein but not radioactive DNA because DNA does not contain sulfur.
II:	'B' shows that viruses are grown in the presence of radioactive phosphorus contained radioactive DNA but not radioactive protein because DNA contains phosphorus but protein does not.
III:	The result 'X' shows bacteria that were infected with viruses that had radioactive DNA were radioactive, indicating that DNA was the material.
IV:	The result 'Y' shows bacteria that were infected with viruses that had radioactive proteins were not radioactive indicating that proteins did not enter the bacteria from the viruses.

1. Only **Statement I** and **Statement II**.
2. Only **Statement I** and **Statement III**.
3. Only **Statement I** and **Statement IV**.
4. Only **Statement III** and **Statement IV**.

104 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	A molecule that can act as a genetic material should be able to express itself in the form of 'Mendelian Characters'.
Reason (R):	A molecule that can act as a genetic material should provide the scope for slow changes.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True but **(R)** is False.

105 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	RNA was the first genetic material.
Reason (R):	RNA can act as the template for the synthesis of DNA and has catalytic functions as well.

In the light of the above statements, choose the most appropriate answer from the options given below :

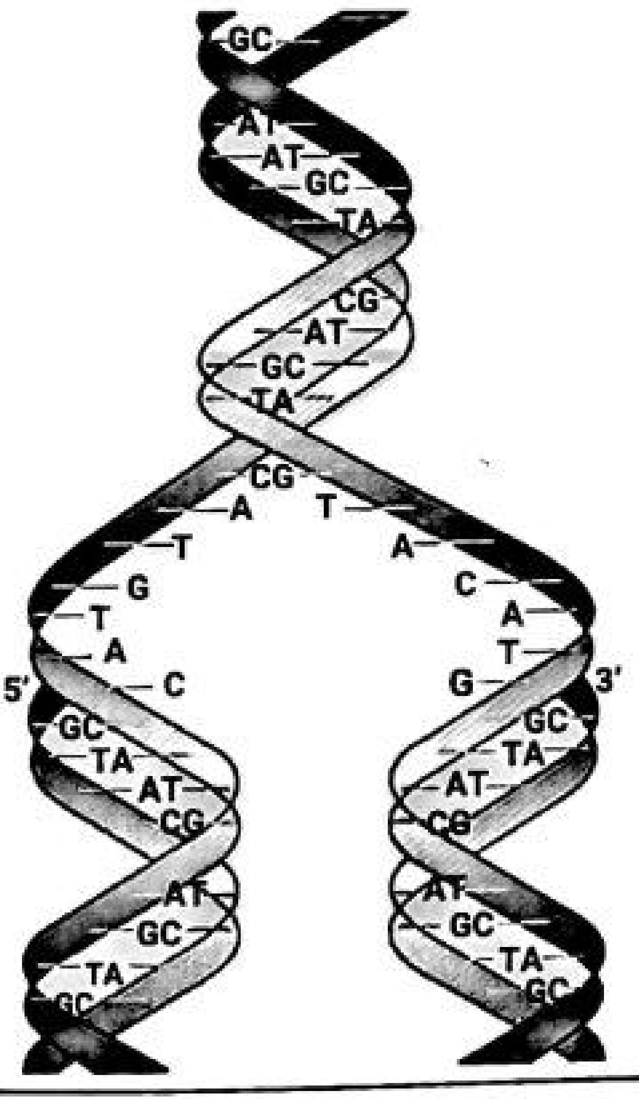
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

106 Consider the two statements:

Statement I:	There is now enough evidence to suggest that essential life processes (such as metabolism, translation, splicing, etc.), evolved around RNA.
Statement II:	DNA being double-stranded and having complementary strands further resists changes by evolving a process of repair.

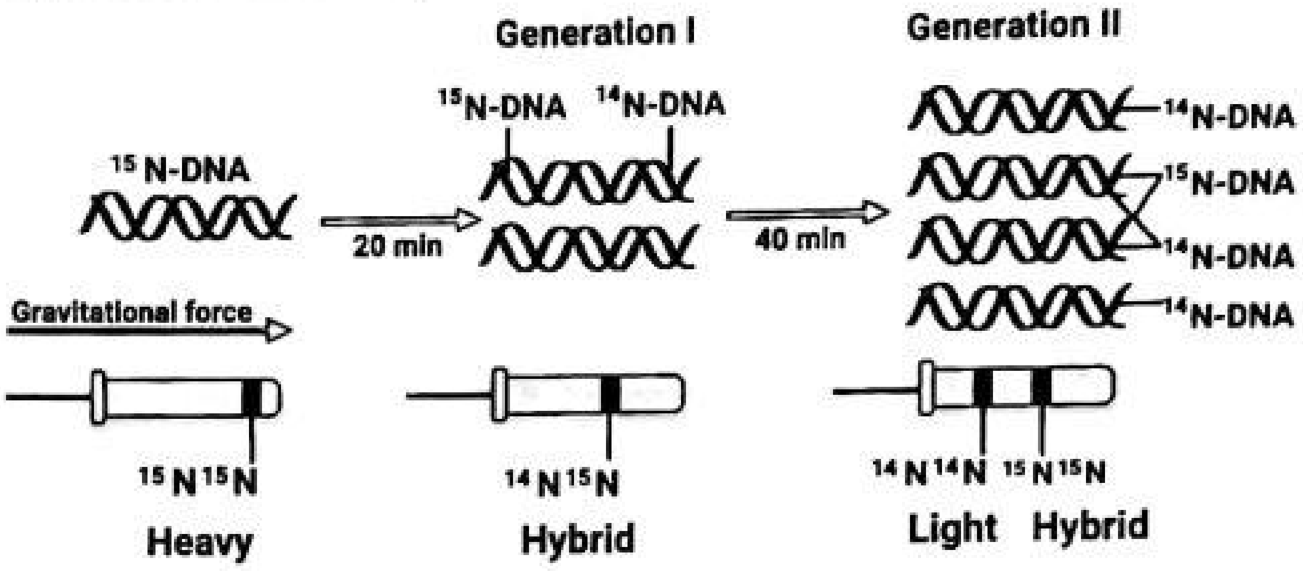
1. **Statement I** is correct, **Statement II** is correct
2. **Statement I** is correct, **Statement II** is incorrect
3. **Statement I** is incorrect, **Statement II** is correct
4. **Statement I** is incorrect, **Statement II** is incorrect

107 The given figure shows:



1.	Watson and Crick's model for semi-conservative DNA replication
2.	Temin and Baltimore model for reverse transcription
3.	Transcription of rRNA and tRNA on the template of DNA
4.	Transcription of mRNA and hnRNA on the template of DNA

108 The figure shows the Meselson and Stahl experiment. Identify the correct statements:



I:	The result at the end of 20 minutes excludes the 'conservative' mode of DNA replication.
II:	The result at the end of 40 minutes excludes the 'dispersive' mode of DNA replication.

1. **Statement I** is correct, **Statement II** is incorrect.
2. **Statement I** is incorrect, **Statement II** is correct.
3. **Statement I** is incorrect, **Statement II** is incorrect.
4. **Statement I** is correct, **Statement II** is correct.

109 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Deoxyribonulceoside triphosphates provide energy for polymerization reactions during the replication of DNA.
Reason (R):	The two terminal phosphates in a deoxyribonucleoside triphosphate are high-energy phosphates, the same as in the case of ATP.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.

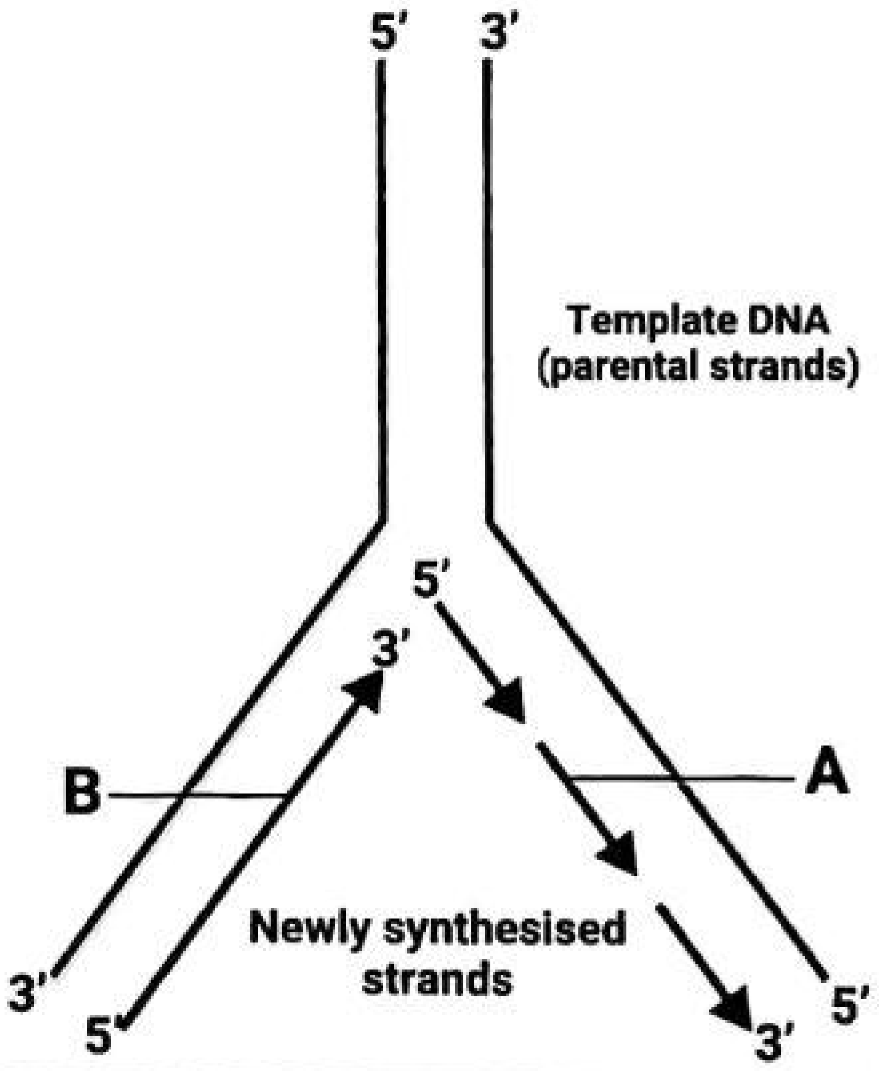
110 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	For long DNA molecules, the replication occurs within a small opening of the DNA helix, referred to as the replication fork.
Reason (R):	The DNA polymerases on their own cannot initiate the process of replication.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True but **(R)** is False.

111 The figure shows the replicating fork during DNA replication. Identify the correct statements.



Statement I:	A is an Okazaki fragment and such fragments make up the lagging strand which is replicated away from the replication fork.
Statement II:	B is the leading strand that is continuously replicated towards the replication fork.

1. **Statement I** is correct, **Statement II** is incorrect.
2. **Statement I** is incorrect, **Statement II** is correct.
3. **Statement I** is incorrect, **Statement II** is incorrect.
4. **Statement I** is correct, **Statement II** is correct.

112 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	A piece of DNA if needed to be propagated during recombinant DNA procedures requires a vector.
Reason (R):	The vectors provide the origin of replication.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

113 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The replication of DNA and cell division cycle should be highly coordinated.
Reason (R):	In eukaryotes, the replication of DNA takes place at the S-phase of the cell cycle.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

114 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	It is necessary to define the boundaries that would demarcate the region and the strand of DNA that would be transcribed.
Reason (R):	Reason: Both strands of DNA are not copied during transcription.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.

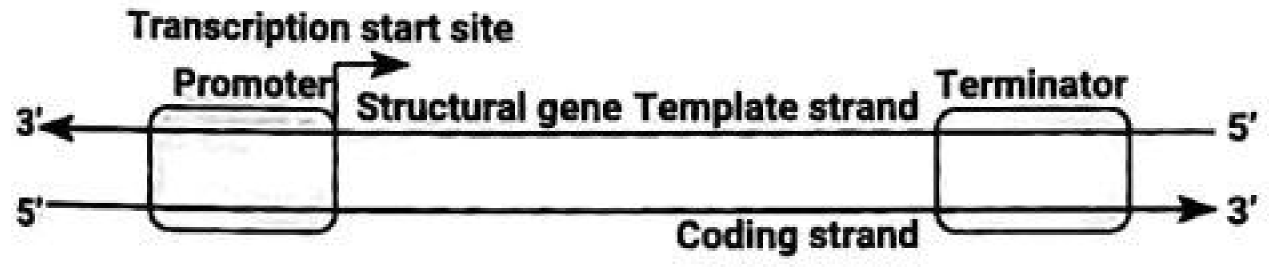
115 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Both the strands of DNA are not copied during transcription.
Reason (R):	Both strands of DNA are identical in their base composition.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.

116 Consider the transcription unit given in the following diagram and choose the correct statements:


Transcription start site
Promoter
Structural gene Template strand
Terminator
3'
5'
5'
3'
Coding strand

I:	The promoter on the template is situated upstream and 5' to the structural gene.
II:	It is the presence of the structural gene that defines the template strand.
III:	The coding strand does not code for anything and is displaced during transcription.

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

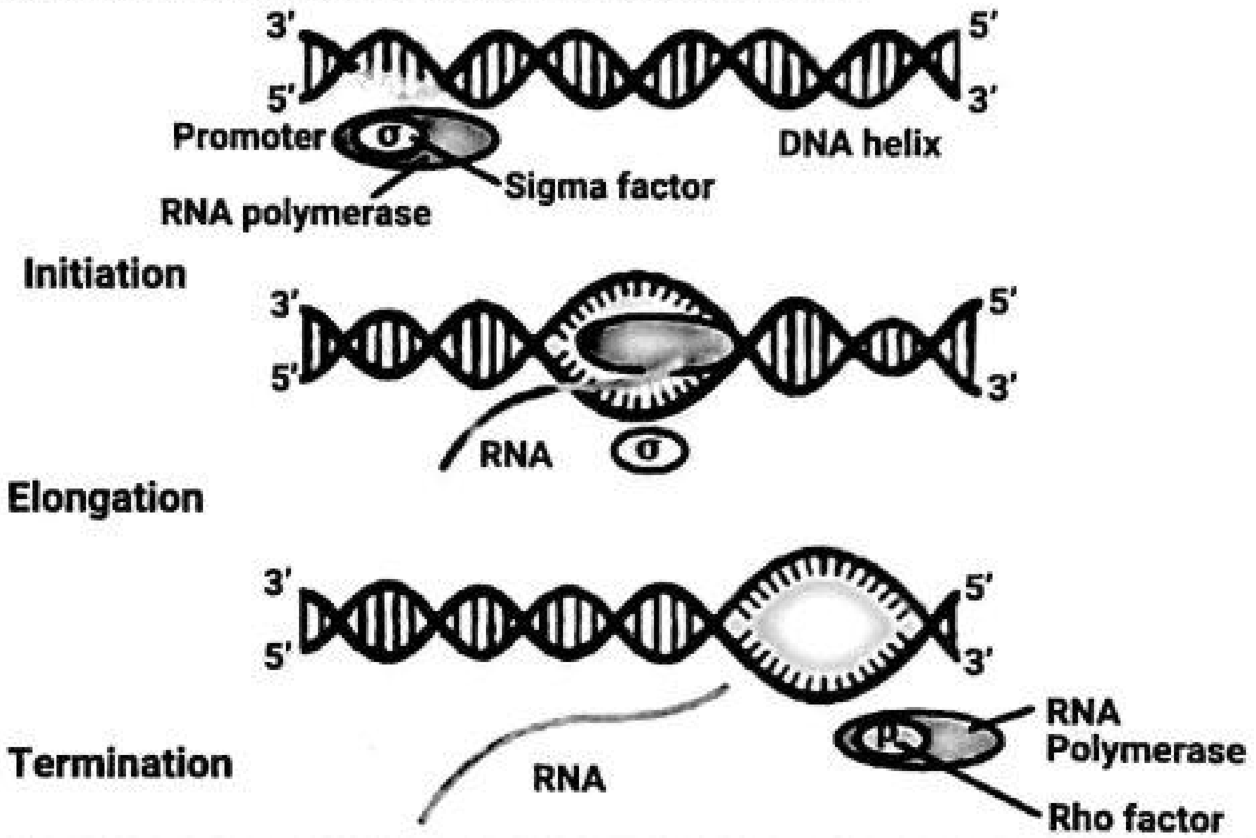
117 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In transcription, the strand that does not code for anything is referred to as the coding strand.
Reason (R):	It is the presence of the promoter in a transcription unit that defines the template and coding strands.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True but **(R)** is False.

118 Study the diagram given below and choose the correct information that can be deduced:


3'
5'
5'
3'
Promoter
σ
DNA helix
Sigma factor
RNA polymerase
Initiation
3'
5'
5'
3'
RNA
σ
Elongation
3'
5'
5'
3'
Termination
RNA
RNA Polymerase
Rho factor

1.	The core RNA polymerase is capable of catalyzing elongation only.
2.	Sigma factor and Rho factor are needed for the termination of transcription.
3.	DNA Helicase opens the strand of the DNA.
4.	Both strands of DNA are transcribed by the same RNA polymerase.

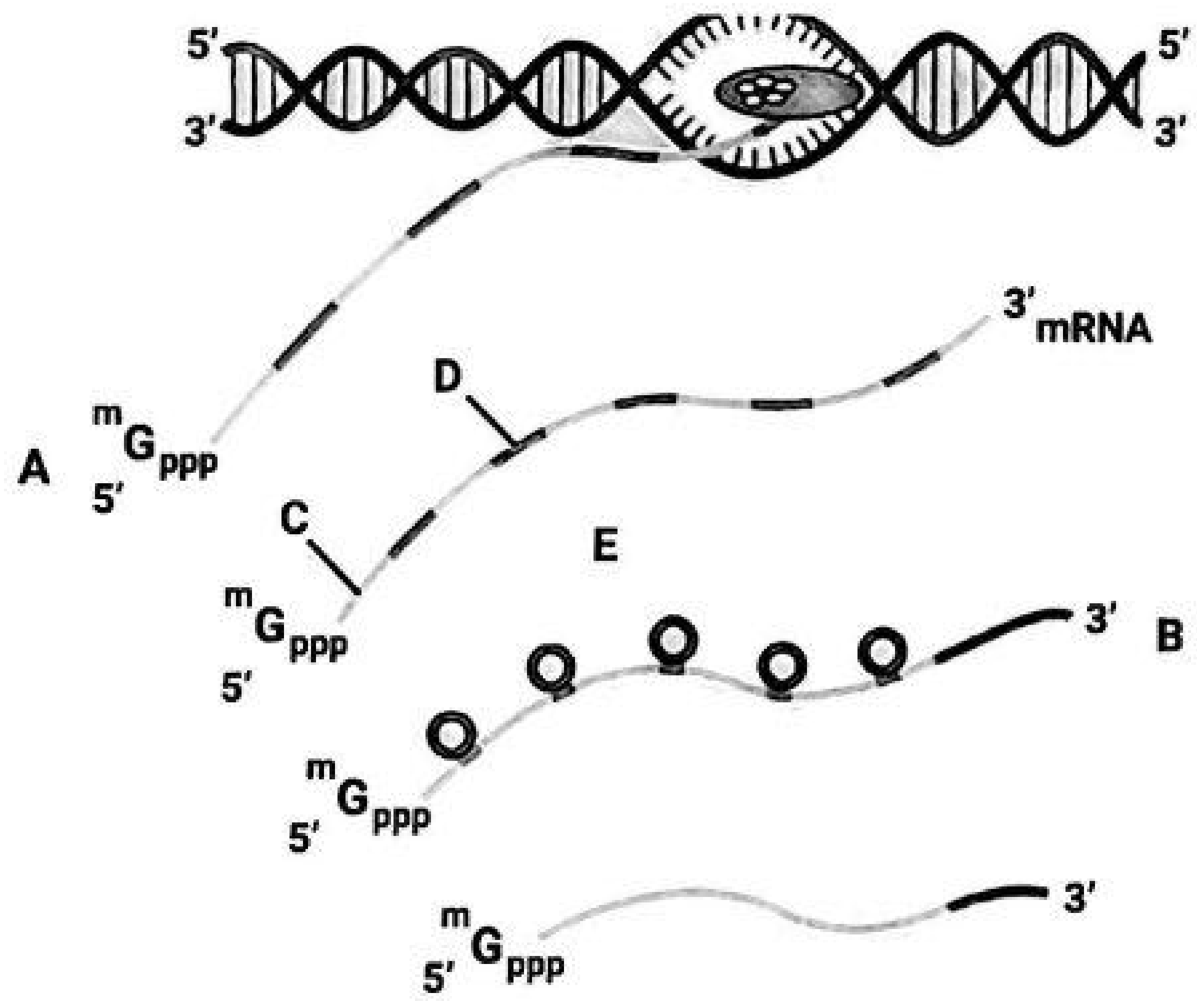
119 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Transcription and translation can be coupled in bacteria.
Reason (R):	In bacteria, the mRNA does not require any processing to become active, and also transcription and translation take place in the same compartment.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

120 The figure shows the process of transcription in eukaryotes. Identify the incorrect statements regarding the process:



Statement I:	'A' is capping where an unusual nucleotide (methyl guanosine triphosphate) is added to the 5'-end of hnRNA.
Statement II:	'B' is polyadenylation where 20-30 adenylate residues are added at the 3' end in a template-dependent manner.
Statement III:	"C" constitute the sequences of the split gene that do not appear in mature or processed RNA.
Statement IV:	The presence of D in the eukaryotic split gene is reminiscent of antiquity.
Statement IV:	'E' is called as RNA splicing.

1. Only **Statement I** and **Statement III**
2. Only **Statement II** and **Statement III**
3. Only **Statement II** and **Statement IV**
4. Only **Statement I** and **Statement IV**

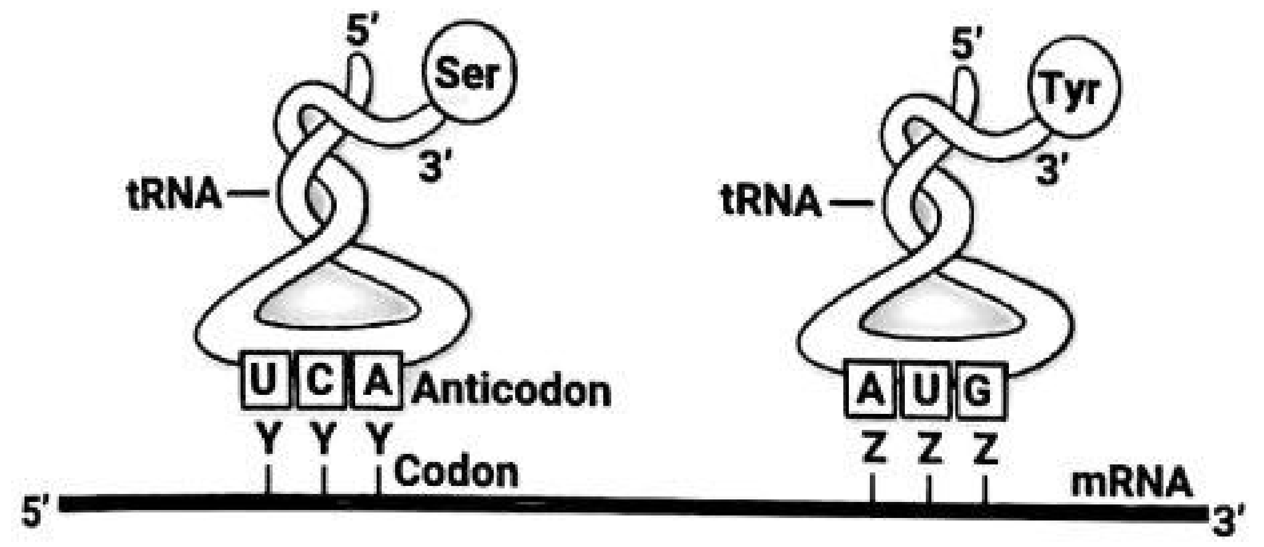
121 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	An adapter molecule, that on one hand can read the genetic code and on the other hand can bind to specific amino acids, is required for the translation of proteins.
Reason (R):	Amino acids have no structural specialties to read the code uniquely.

In the light of the above statements, choose the most appropriate answer from the options given below :

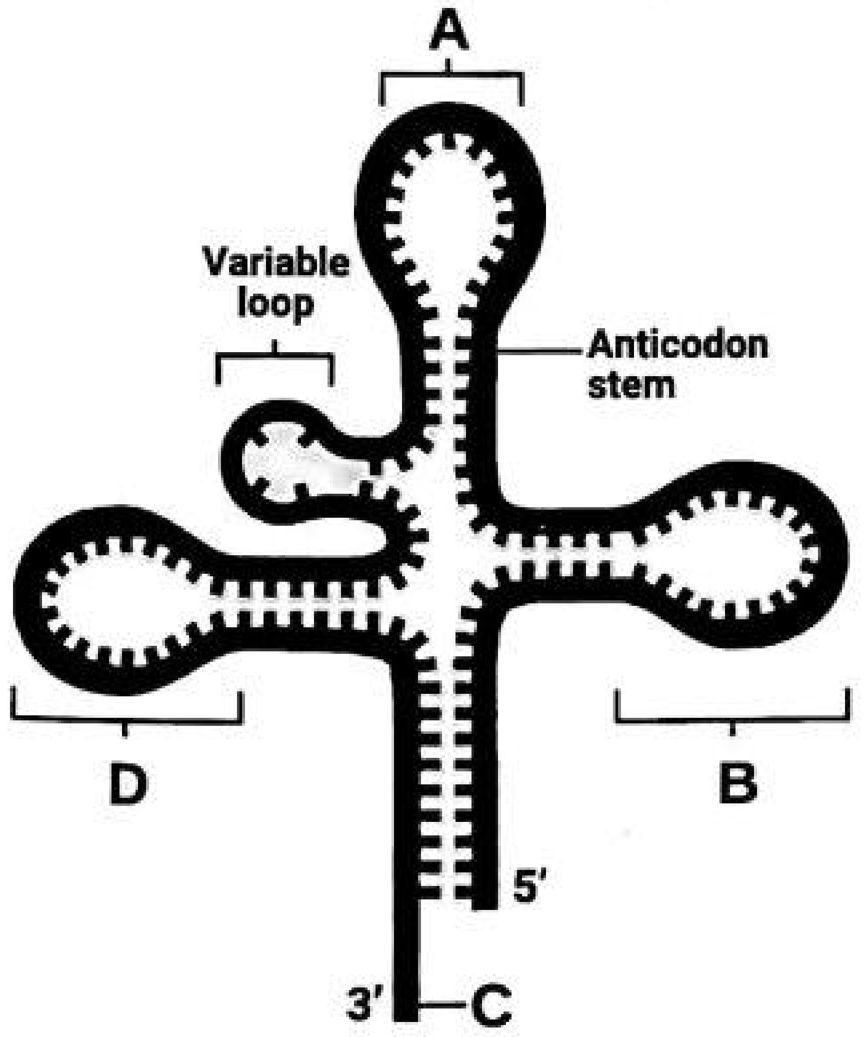
1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

122 The codons represented as YYY and ZZZ in the given figure, respectively, can be:



1. 5'-AGU-3' and 5'-UAC-3'
2. 3'-AGU-5' and 3'-UAC-5'
3. 5'-TCA -3' and 5'-ATG-3'
4. 3'-TCA -5' and 3'-ATG-5'

123 In the given figure, identify A-D.



	A	B	C	D
1.	Amino acid binding site	DHU loop	Anticodon	TψC loop
2.	Amino acid binding site	TψC loop	Anticodon	DHU loop
3.	Anticodon	DHU loop	Amino acid binding site	TψC loop
4.	Anticodon	TψC loop	Amino acid binding site	DHU loop

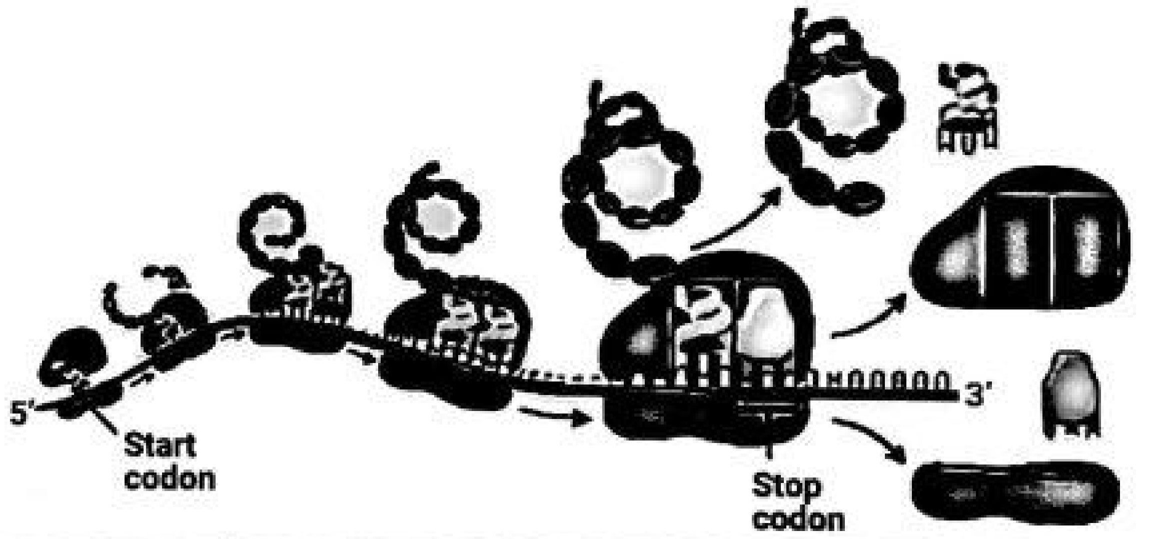
124 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In the first phase of translation, it is important that the charging of tRNA in the presence of ATP takes place.
Reason (R):	The formation of a peptide bond requires energy.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

125 Study the given diagram and select the correct statements:



Statement I:	The formation seen in the figure is called as polyribosome.
Statement II:	Ribosomes of a polyribosome translate different proteins.

1. **Statement I** is correct, **Statement II** is correct.
2. **Statement I** is correct, **Statement II** is incorrect.
3. **Statement I** is incorrect, **Statement II** is correct.
4. **Statement I** is incorrect, **Statement II** is incorrect.

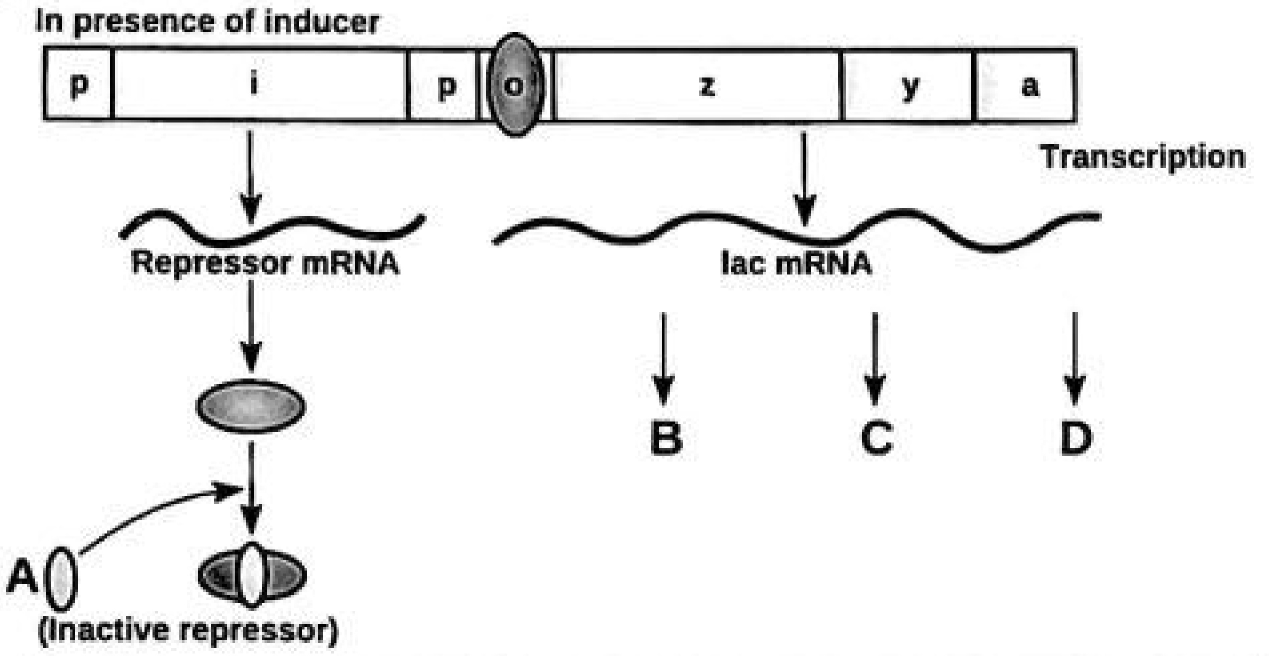
126 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In a transcription unit, the activity of RNA polymerase at a given promoter is in turn regulated by interaction with accessory proteins.
Reason (R):	These regulatory proteins can act both positively (activators) and negatively (repressors).

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A).**
2. Both **(A)** and **(R)** are False.
3. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4. **(A)** is True but **(R)** is False.

127 Consider the following diagram showing the working of the lac operon in *E.coli* in the presence of an inducer and choose the correct statement from the ones given below:



1. A is the inducer and can be either lactose or cAMP.
2. B is the enzyme that will metabolize glucose, the preferred energy source.
3. Some amount of C will be present in the cell even if lactose is absent.
4. The absence of D will stop lactose from entering the cell.

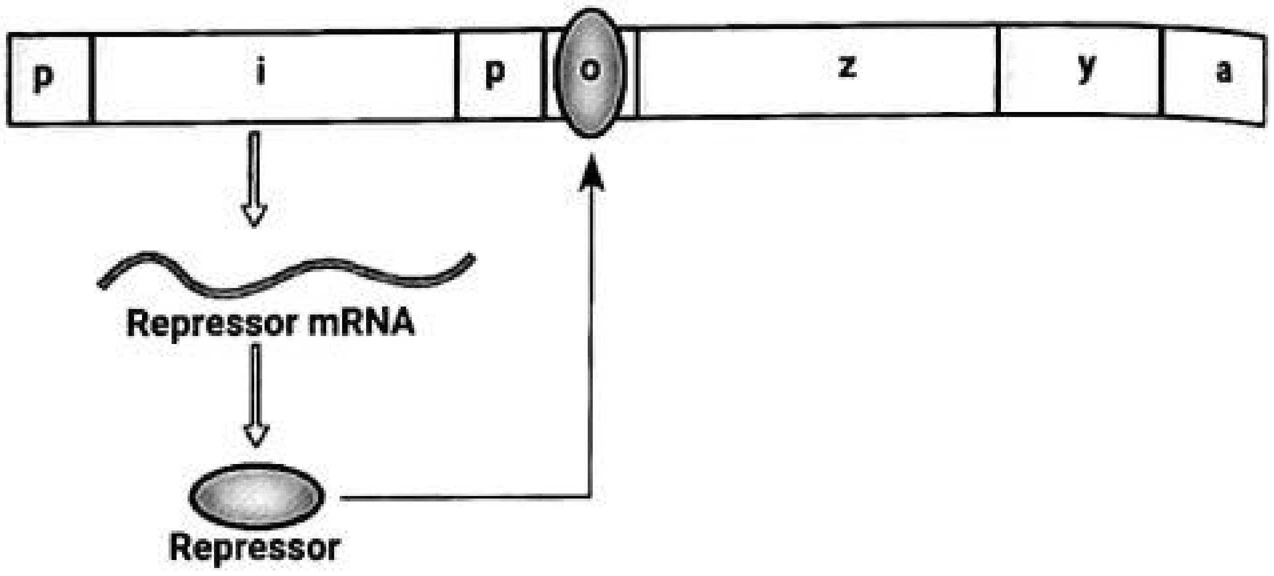
128 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Lactose is the inducer of the *lac* operon in *E.coli.*
Reason (R):	Lactose is the inhibitor of the *lac* operon.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are False.
3. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4. **(A)** is True but **(R)** is False.

129 Study the diagram of the lac operon given below and select the correct statements:



Statement I:	This is the working of a lac operon in the absence of an inducer.
Statement II:	Repressor binds to the operator region and allows RNA polymerase to transcribe the operon.

1. Only **Statement I**
2. Only **Statement II**
3. Both **Statement I** and **Statement II**
4. Neither **Statement I** nor **Statement II**

130 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Regulation of *lac* operon by a repressor is referred to as negative regulation.
Reason (R):	*lac* operon is under the control of positive regulation as well.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A).**
2. Both **(A)** and **(R)** are False.
3. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4. **(A)** is True but **(R)** is False.

131 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Human Genome Project was closely associated with the rapid development of a new area in biology called Bioinformatics.
Reason (R):	One of the greatest impacts of having the Human Genome sequence may well be enabling a radically new approach to biological research.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True but **(R)** is False.

132 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Learning about non-human organisms DNA sequences is not important for human beings.
Reason (R):	The Genetic code is not universal.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

133 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	During density gradient centrifugation, repetitive DNA are separated from bulk genomic DNA as different peaks.
Reason (R):	The probability of observing DNA polymorphism in non-coding sequences of DNA is higher than in the coding sequences.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

134 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Repetitive units of DNA, micro-satellites, and mini-satellites are the basis of DNA fingerprinting.
Reason (R):	DNA fingerprinting is the basis of paternity testing, in cases of disputes.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	**(A)** is True but **(R)** is False.

135 DNA fingerprinting:

Statement I:	involves identifying differences in some specific regions in DNA sequence called as repetitive DNA.
Statement II:	repetitive DNA is separated from bulk genomic DNA as different peaks during density gradient centrifugation.

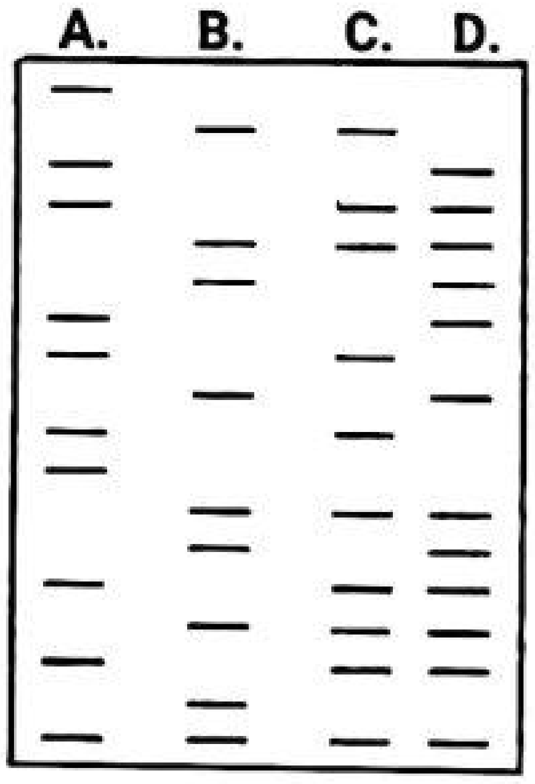
1.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I.**
2.	Only **Statement I** is correct.
3.	Only **Statement II** is correct.
4.	Both **Statement I** and **Statement II** are incorrect.

136 Consider the two statements:

Statement I:	Since DNA from every tissue (such as blood, hair follicle, skin, bone, saliva, sperm etc.), from an individual show the same degree of polymorphism, they become very useful identification tools in forensic applications.
Statement II:	As polymorphisms are inheritable from parents to children, DNA fingerprinting is the basis of paternity testing, in case of disputes.

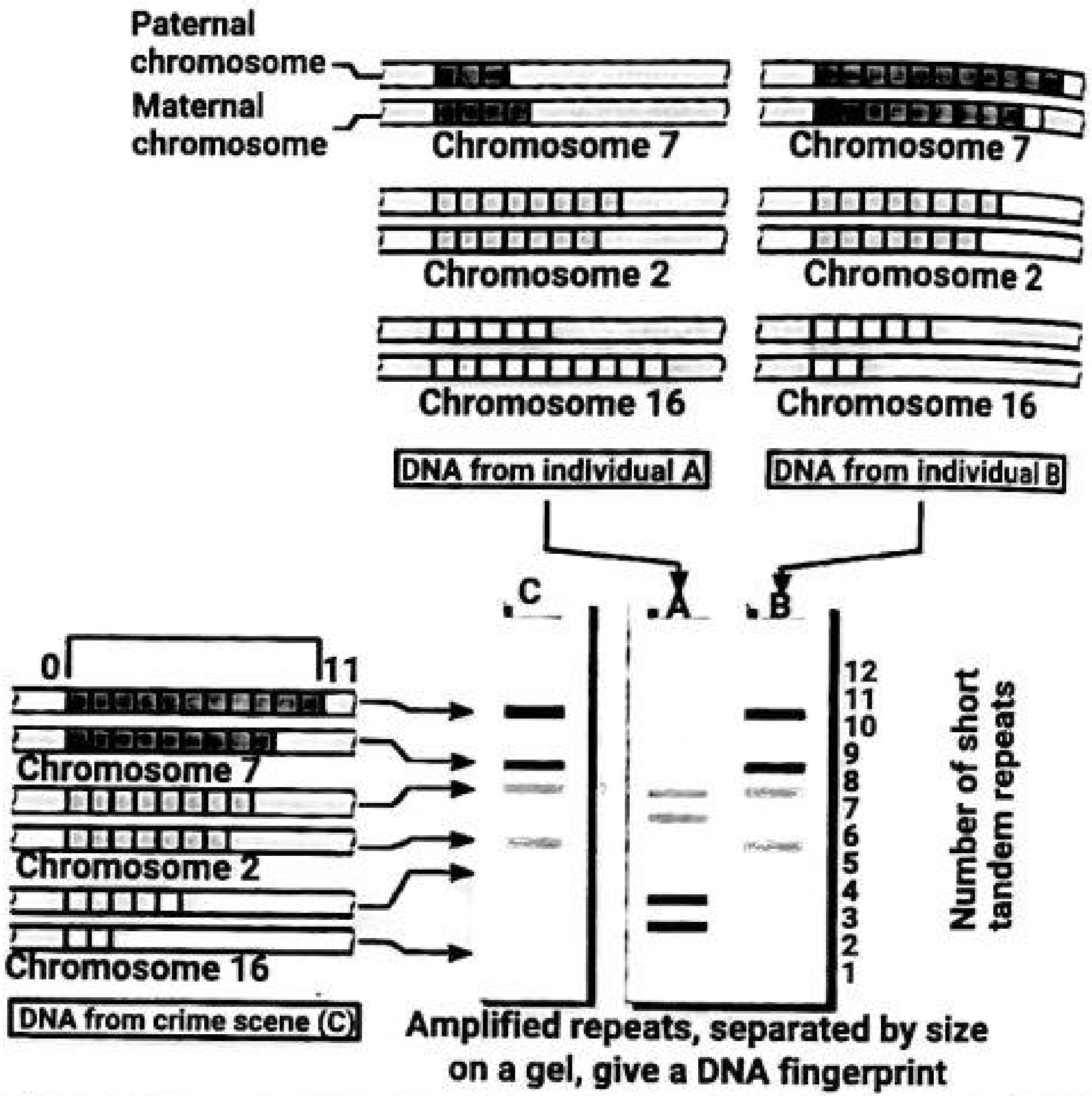
1. Both **Statement I** and **Statement II** are correct
2. Only **Statement I** is correct
3. Only **Statement II** is correct
4. Both **Statement I** and **Statement II** are incorrect

137 The DNA profiles below represent four different individuals. Which of the following statements is consistent with the results?



1. B is the child of A and C.
2. C is the child of A and B.
3. D is the child of B and C.
4. A is the child of B and C.

138 Which of the following cannot be inferred from the information given in the following diagram?

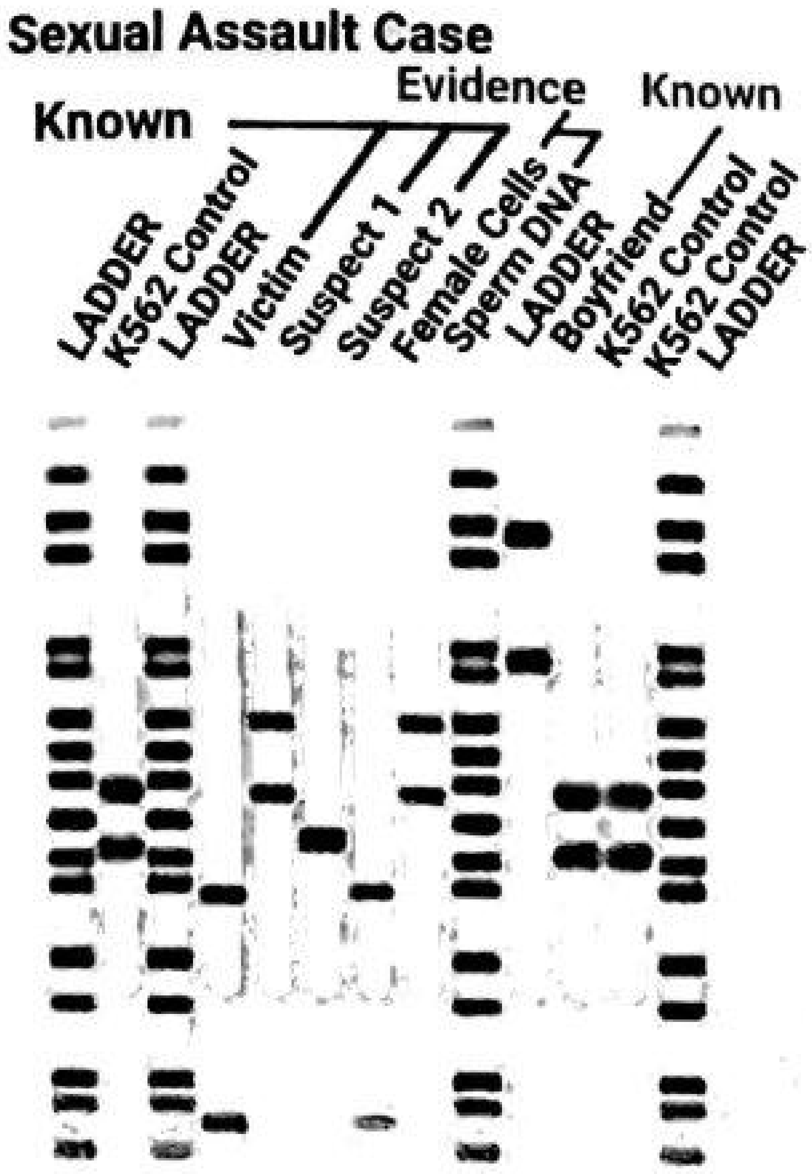

Paternal chromosome
Maternal chromosome
Chromosome 7
Chromosome 7
Chromosome 2
Chromosome 2
Chromosome 16
Chromosome 16
DNA from individual A
DNA from individual B
C
A
B
0
11
Chromosome 7
Chromosome 2
Chromosome 16
DNA from crime scene (C)
12
11
10
9
8
7
6
5
4
3
2
1
Number of short tandem repeats
Amplified repeats, separated by size on a gel, give a DNA fingerprint

1.	The DNA from the crime scene matches that of individual B
2.	VNTRs are hypervariable
3.	The larger fragments remain near the point of introduction in the gel electrophoresis
4.	The smaller chromosomes in the human genome have smaller repeats of VNTR

139 The given figure is of DNA profiles of DNA samples taken from the crime scene, the female who was a victim of sexual assault and from two suspects in a sexual assault case. The DNA sample of the boyfriend of the assaulted female was also tested and his DNA profile was also created.

The 'Ladders' in the figure are helpful in judging the sizes of the DNA fragments in the profile of DNA samples tested. Control samples ensure that the experiment is done correctly.

Who is responsible for the crime?


Sexual Assault Case
Known
Evidence
Known
LADDER
K562 Control
LADDER
Victim
Suspect 1
Suspect 2
Female Cells
Sperm DNA
LADDER
Boyfriend
K562 Control
K562 Control
LADDER

1. The boyfriend
2. Suspect 1
3. Suspect 2
4. None of the tested persons could have committed the crime as their profiles do not match with the sample taken from the crime scene.

EVOLUTION

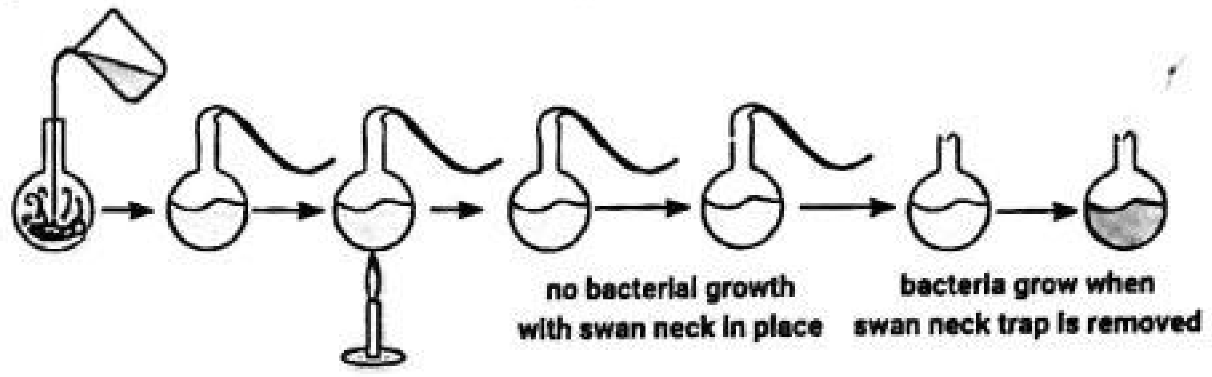
140 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	When we look at stars on a clear night sky we are, in a way, looking back in time.
Reason (R):	When we see objects in our immediate surroundings we see them instantly and hence in the present time.

In the light of the above statements, choose the most appropriate answer from the options given below :

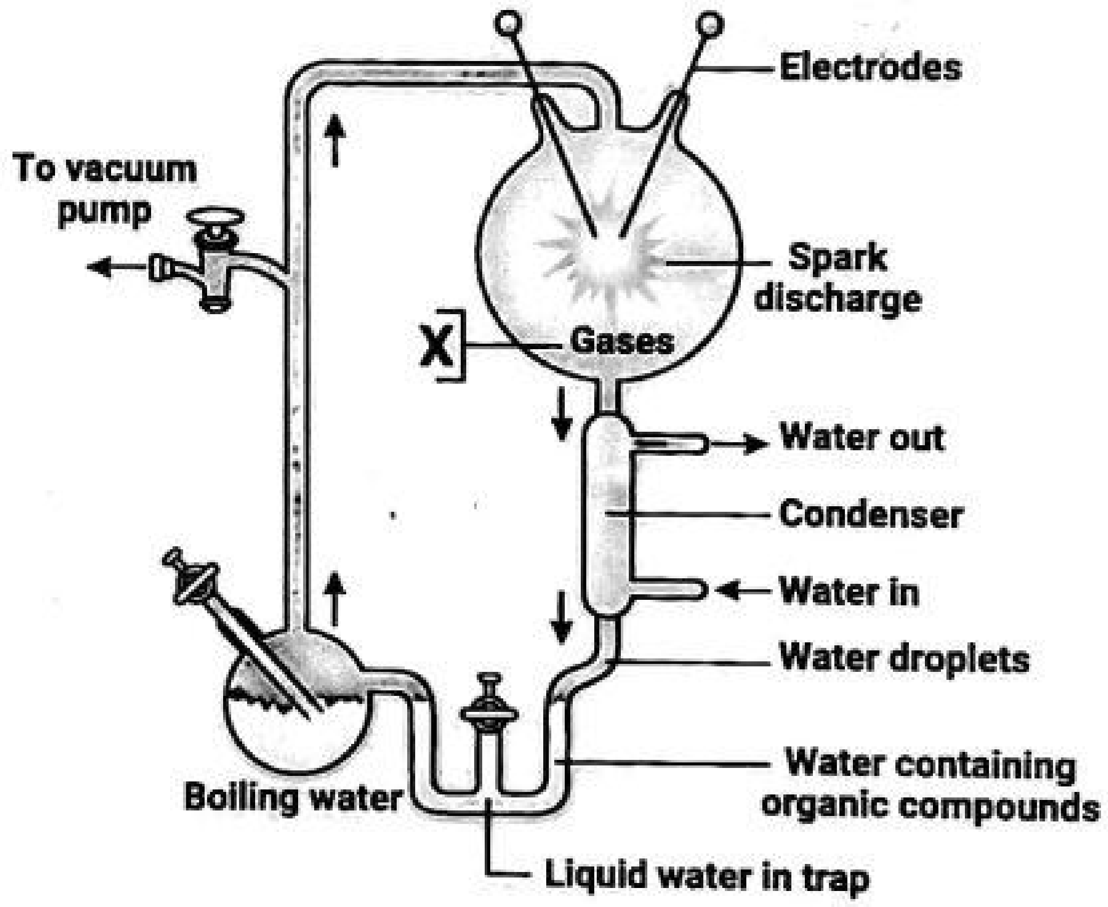
1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3. **(A)** is True but **(R)** is False.
4. **(A)** is False but **(R)** is True.

141 The figure shows an experiment that demonstrated that life comes only from pre-existing life. This experiment was conducted by:


no bacterial growth with swan neck in place
bacteria grow when swan neck trap is removed

1. Spallanzani
2. Francesco Redi
3. Louis Pasteur
4. van Helmont

142 Given below is the diagrammatic representation of Miller's experiment where 'X' represents the gases used in the experiment. Identify the correct combination of the gases used by Miller in his experiment from the options given:


Electrodes
To vacuum pump
Spark discharge
X
Gases
Water out
Condenser
Water in
Water droplets
Water containing organic compounds
Boiling water
Liquid water in trap

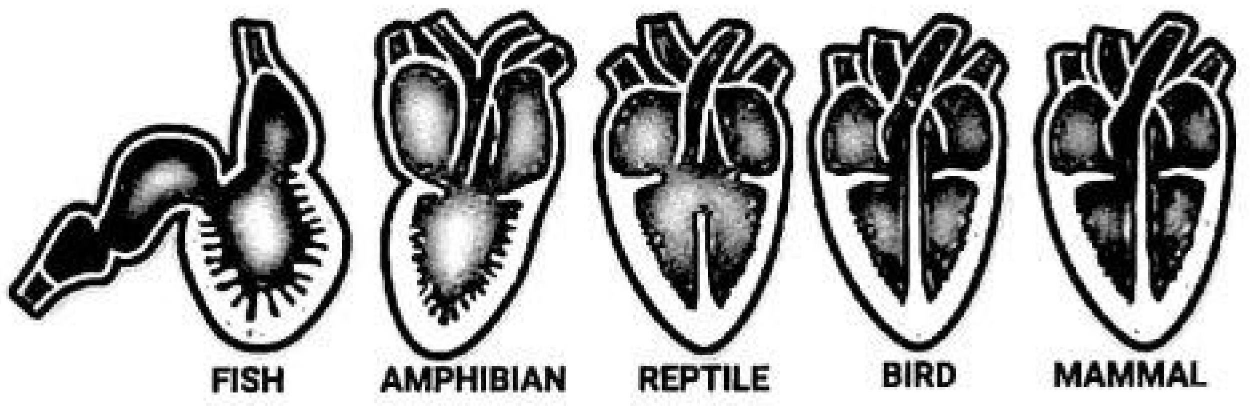
1. Methane, Carbon dioxide, Oxygen, and Hydrogen
2. Methane, Ammonia, Water vapour, and Hydrogen
3. Hydrogen cyanide, Carbon dioxide, Ammonia, and Hydrogen
4. Hydrogen sulphide, Ammonia, Oxygen, and Hydrogen

143 Consider the two statements:

I:	Fitness, according to Darwin, refers ultimately and only to reproductive fitness.
II:	Those who are a better fit in an environment, leave more progeny than others.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**.
2.	**Statement I** is correct and **Statement II** is incorrect.
3.	**Statement I** is incorrect and **Statement II** is correct.
4.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**.

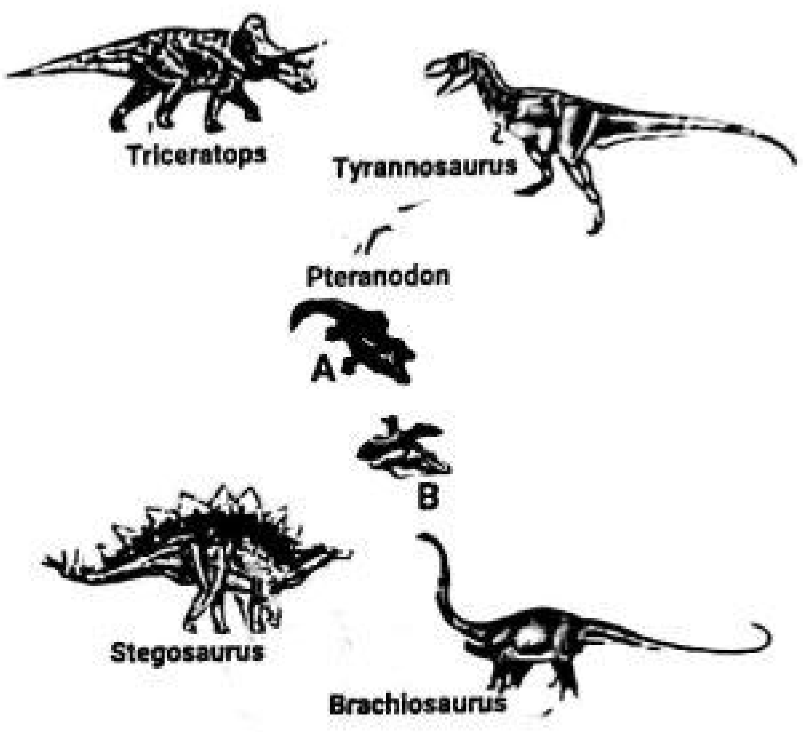
144 Look at the figure showing hearts in different vertebrates and select the correct statements:



Statement I:	The hearts in different vertebrates are homologous organs.
Statement II:	They have developed in different groups as a result of convergent evolution between them.

1.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**.
2.	**Statement I** is correct and **Statement II** is incorrect.
3.	**Statement I** is incorrect and **Statement II** is correct.
4.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**.

145 The figure shows a family tree of dinosaurs and their living modern-day counterpart organisms. Study the given two statements:



Statement I:	'A' denotes 'crocodilians' that have a four chambered heart and endothermy similar to the birds and the mammals.
Statement II:	'B' denotes 'Archaeopteryx', a connecting link between reptiles and birds and has been found as a complete specimen preserved as fossil.

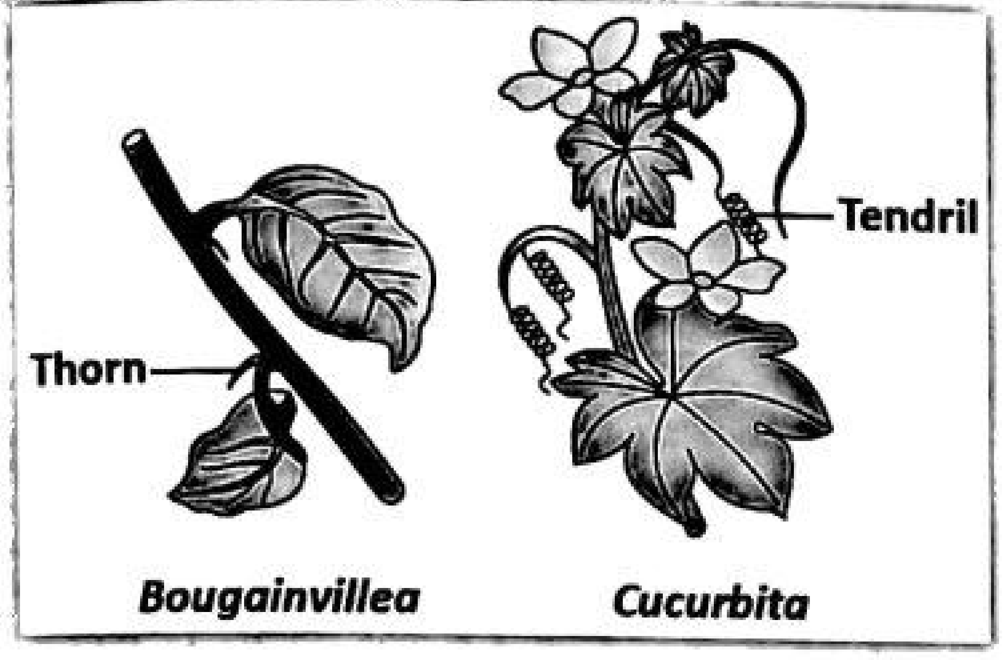
1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

146 Consider the given two statements:

Statement I:	The embryos of all vertebrates including humans develop a row of vestigial gill slits just behind the head but it is a functional organ only in fish and not found in any other adult vertebrates.
Statement II:	Karl Ernst von Baer noted that embryos never pass through the adult stages of other animals.

1.	**Statement I** is incorrect and **Statement II** is correct.
2.	**Statement I** is correct and **Statement II** is incorrect.
3.	Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**.
4.	Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**.

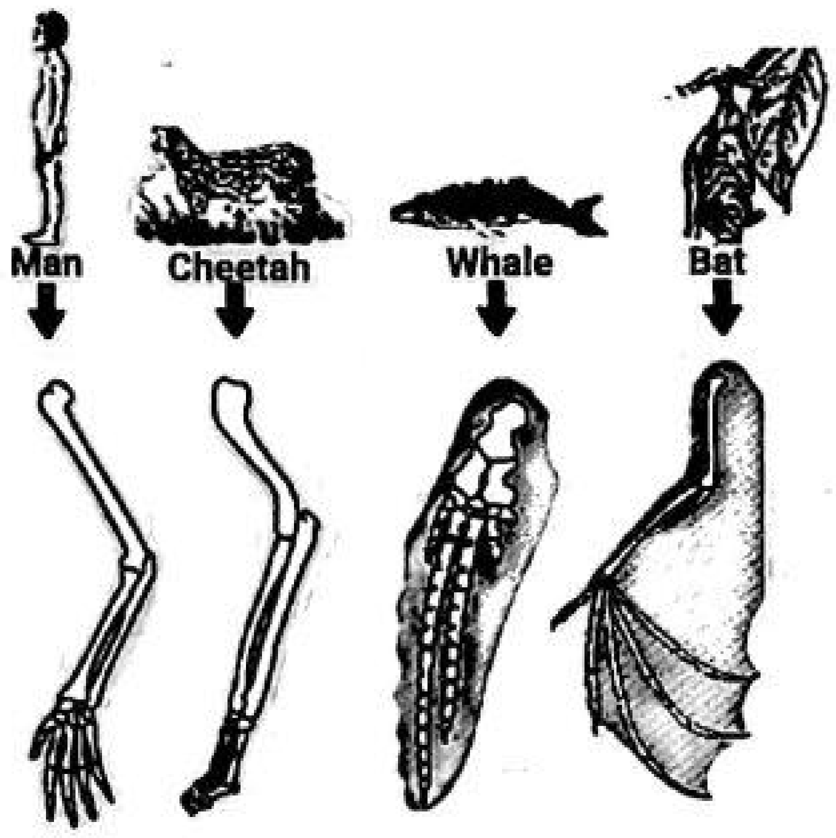
147 The thorn of *Bougainvillea* and the tendril of *Cucurbita are* shown in the figure: Identify the correct statement from the ones given below:



I: represent homology
II: are results of convergent evolution

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

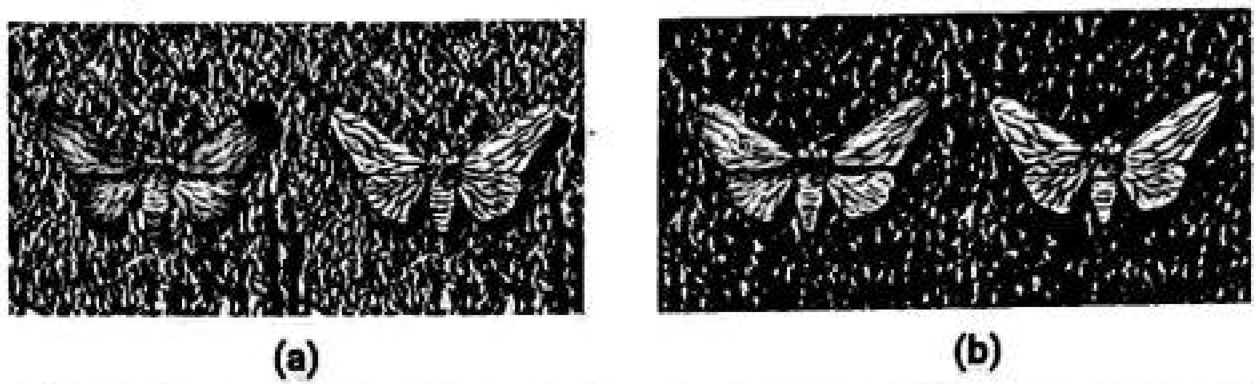
148 The biological relationship of the bones in the forelimbs of mammals is an argument in favour of evolution. What will be true for the forelimbs of the different mammals shown below?



Statement I:	They evolved in a similar environment, rather than inherited from a recent common ancestor.
Statement II:	They have a common descent and have evolved from a shared ancestor.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is correct; **Statement II** is correct
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

149 The given figure shows a white-winged moth and a dark-winged moth (melanised) moth [*Biston betularia*] associated with the phenomenon of 'industrial melanism'. Identify the correct statements:



I:	In (a) the frequency of dark melanic form is expected to be much higher than the white-winged moth due to its protective resemblance with the environment supporting luxuriant growth of lichens on tree trunks.
II:	In (b) the frequency of white-winged moth is expected to be higher than the dark melanic form because the allele for white colour arises by a recurring mutation in the dark melanic form.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

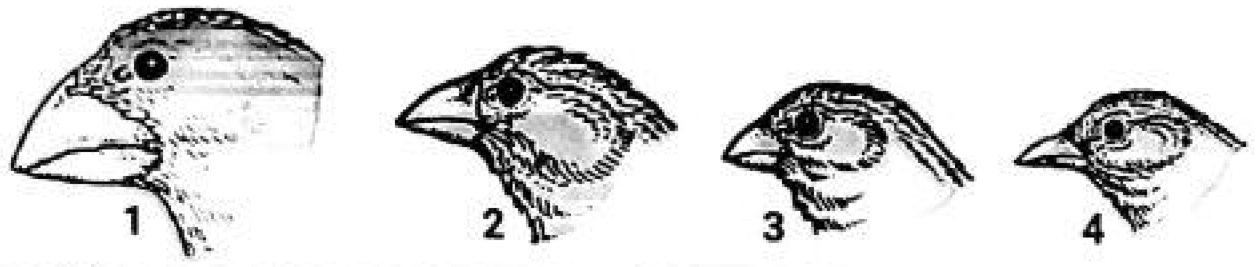
150 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Evolution is not a directed process in the sense of determinism.
Reason (R):	It is a stochastic process based on chance events in nature and chance mutation in the organisms.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

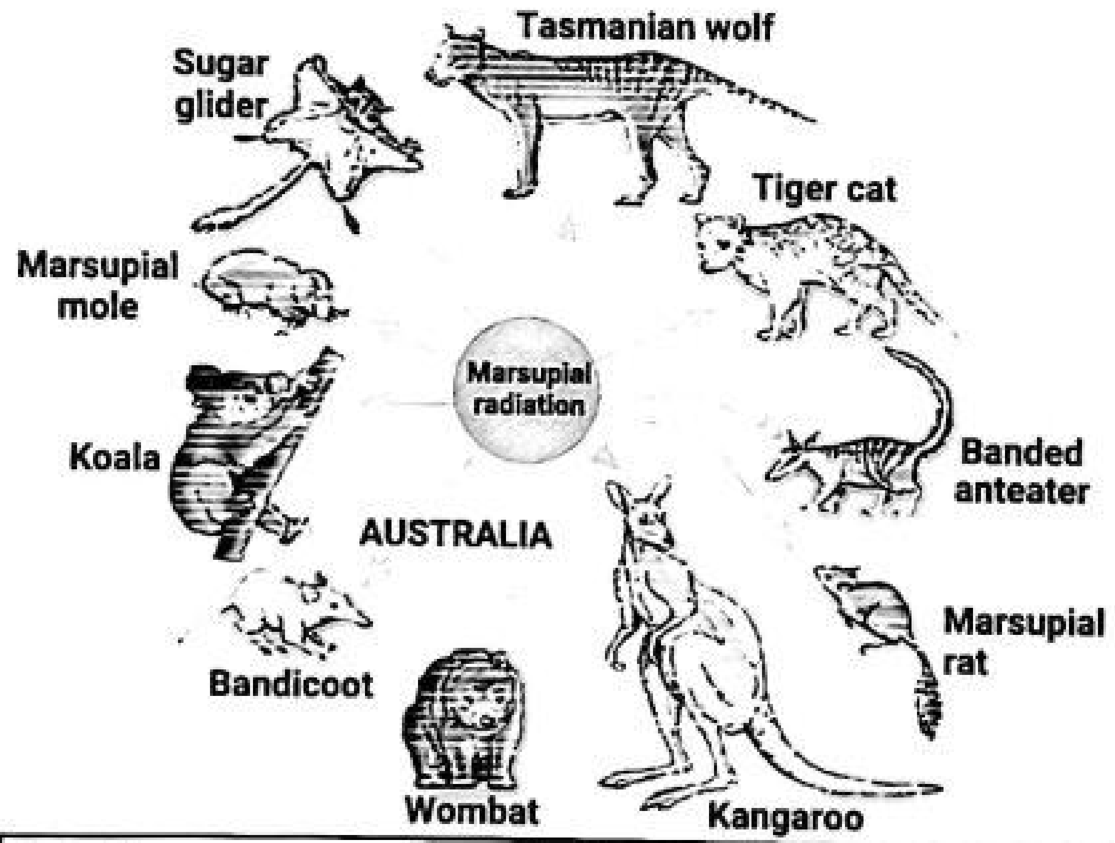
151 The figure shows a variety of beaks of finches that Darwin found in Galapagos Island. 1 is *Geospiza magnirostris*, 2 is *Geospiza fortis*, 3 is *Geospiza parvula* and 4 is *Certhidea olivacea*. What will be true regarding these birds?



I:	Darwin's finches are an excellent example of adaptive radiation.
II:	All the varieties, Darwin conjectured, evolved on the island itself.
III:	From the original seed-eating features, many other forms with altered beaks arose, enabling them to become insectivorous and vegetarian finches.

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

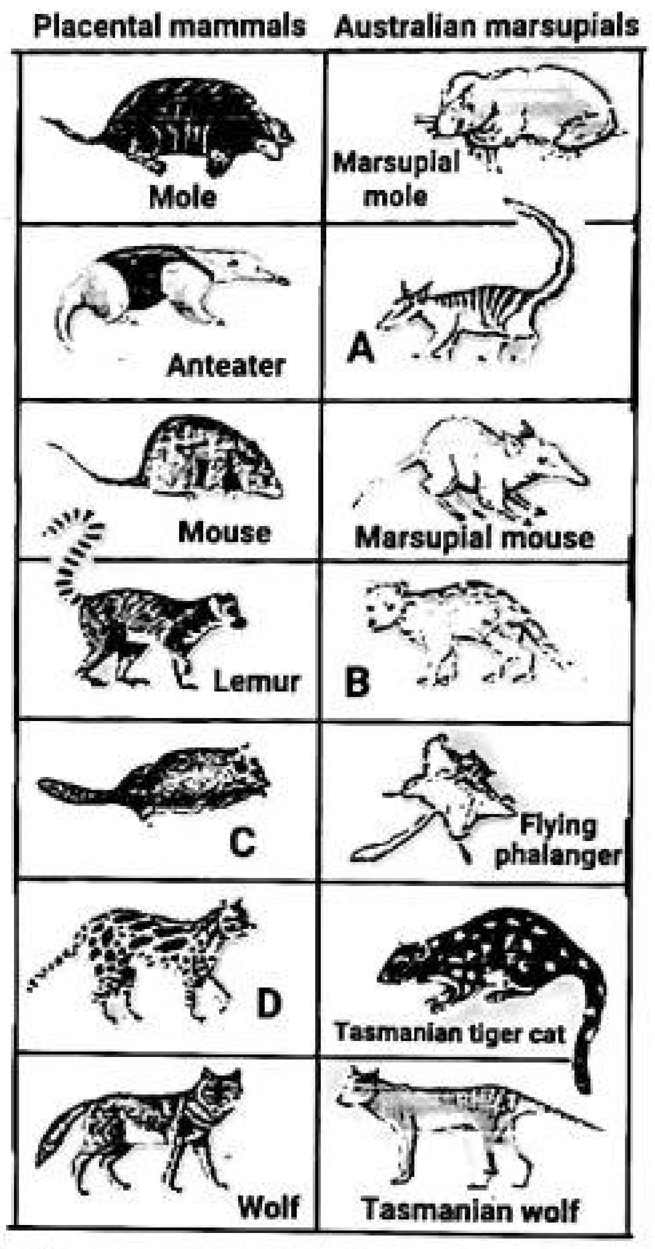
152 The given figure shows the adaptive radiation of marsupials of Australia. What is correct regarding adaptive radiation?


Tasmanian wolf
Sugar glider
Tiger cat
Marsupial mole
Marsupial radiation
Koala
Banded anteater
AUSTRALIA
Marsupial rat
Bandicoot
Wombat
Kangaroo

I:	It is the process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats).
II:	When more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats), one can call this divergent evolution.

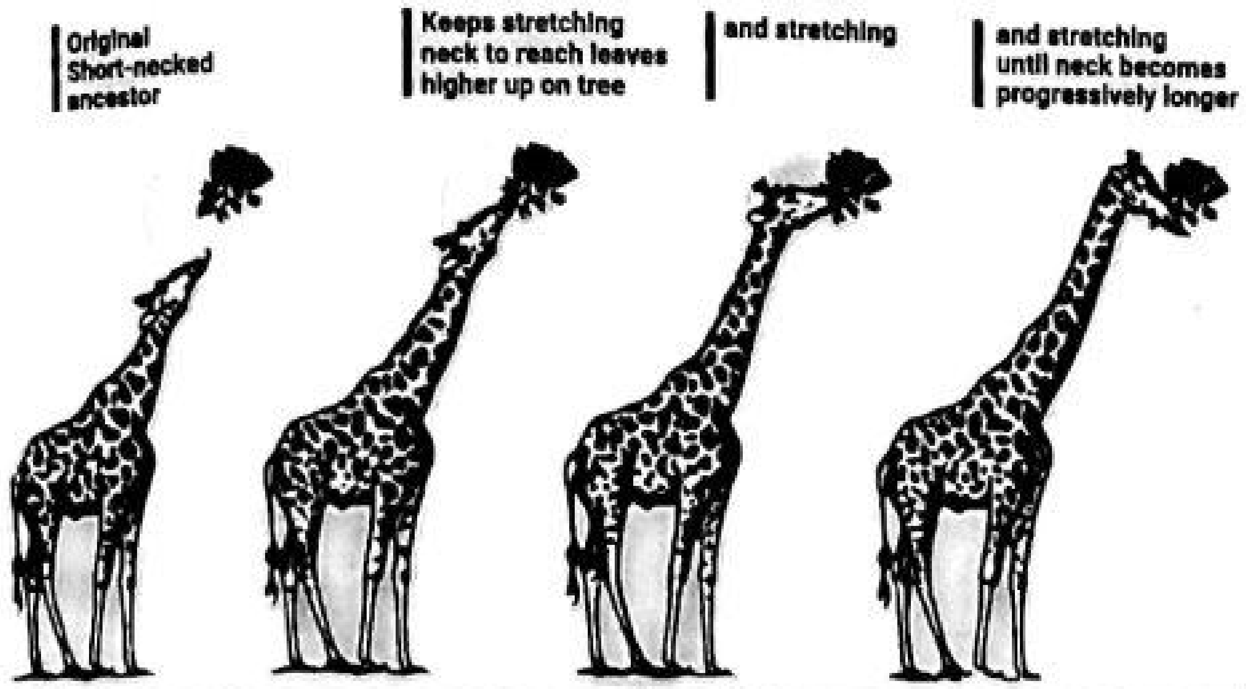
1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

153 Identify A, B C, and D in the given figure showing the convergent evolution of Australian Marsupials and placental mammals:


Placental mammals
Australian marsupials
Mole
Marsupial mole
Anteater
A
Mouse
Marsupial mouse
Lemur
B
C
Flying phalanger
D
Tasmanian tiger cat
Wolf
Tasmanian wolf

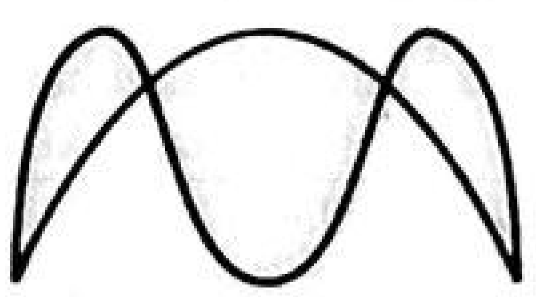
	A	B	C	D
1.	Numbat	Spotted Cuscus	Bobcat	Flying Squirrel
2.	Spotted Cuscus	Numbat	Flying Squirrel	Bobcat
3.	Numbat	Spotted Cuscus	Flying Squirrel	Bobcat
4.	Spotted Cuscus	Numbat	Bobcat	Flying Squirrel

154 The explanation of long necks in Giraffe as shown in the given figure can be attributed to:

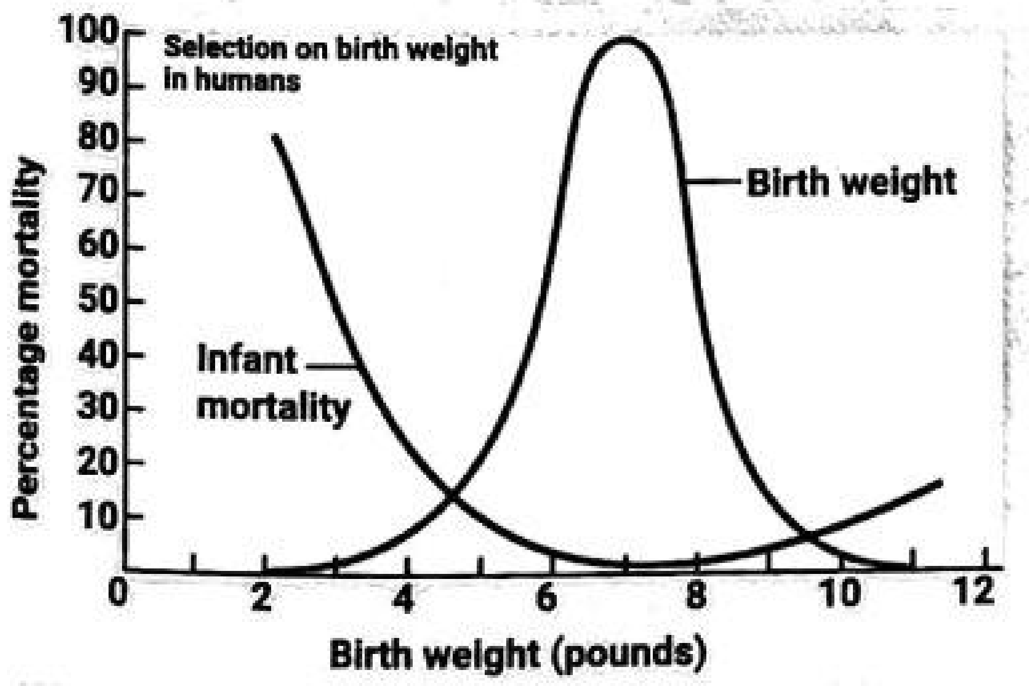

Original Short-necked ancestor
Keeps stretching neck to reach leaves higher up on tree
and stretching
and stretching until neck becomes progressively longer

1.	Charles Darwin	2.	Lamarck
3.	Hugo de Vries	4.	T. R Malthus

155 The natural selection operating as shown in the given figure is called as:

1. Disruptive	
2. Directional	
3. Stabilizing	
4. Retrogressive	

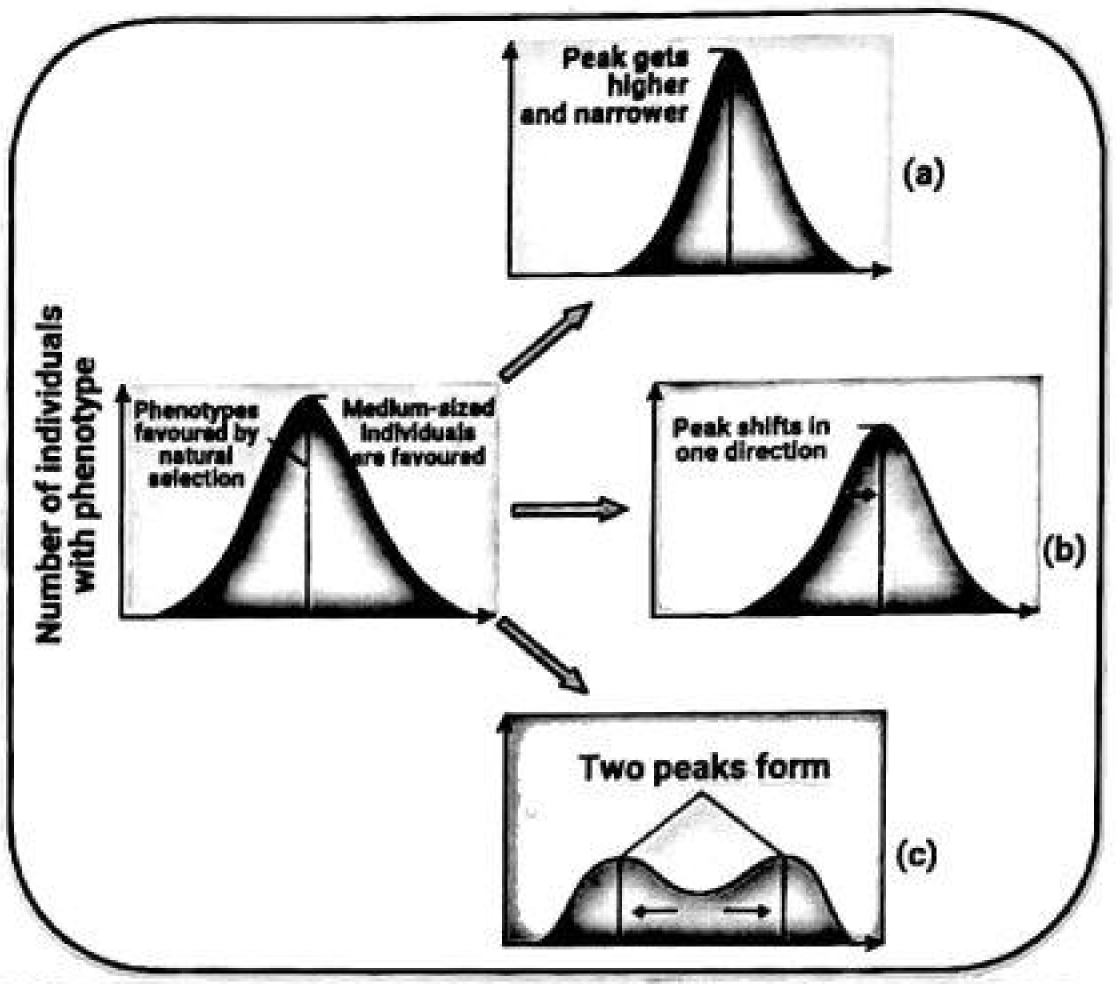
156 Karn & Penrose (1951) showed that birth weight follows a normal distribution, that mortality for newborns is greater for those either under or over-weight, and that the mean birth weight (7 lbs) coincides with that showing minimum mortality.



What type of natural selection is taking place in this case?

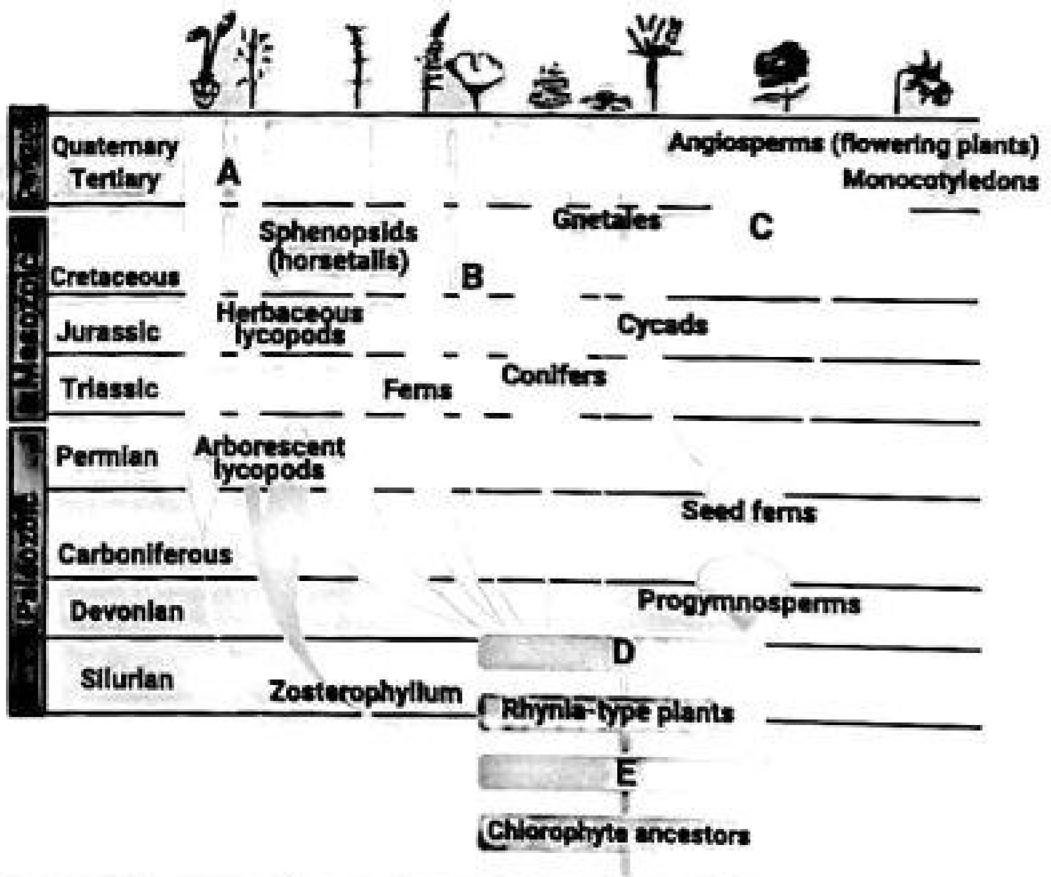
1. Stabilizing
2. Directional
3. Disruptive
4. Natural selection is not taking place in this case

157 The figure shows a diagrammatic representation of the operation of natural selection on different traits. The types of natural selection as shown by (a), (b) and (c) in the figure are:


Number of individuals with phenotype
Phenotypes favoured by natural selection
Medium-sized individuals are favoured
Peak gets higher and narrower
(a)
Peak shifts in one direction
(b)
Two peaks form
(c)

	A	B	C
1.	Stabilising	Directional	Disruptive
2.	Directional	Stabilising	Disruptive
3.	Disruptive	Directional	Stabilising
4.	Stabilising	Disruptive	Directional

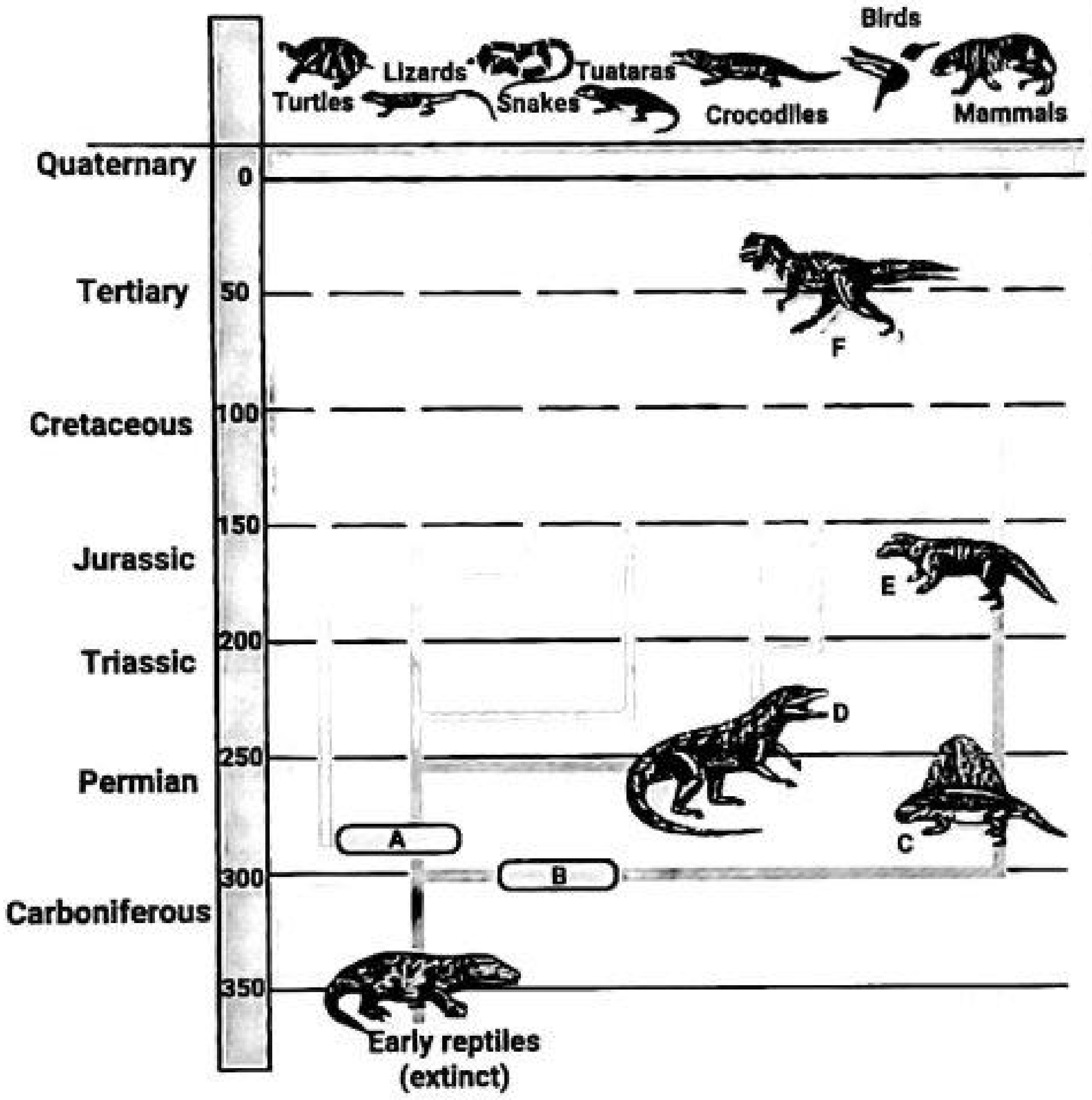
158 Identify A, B, C, D and E in the given sketch of the evolution of plant forms through geological periods:


Quaternary
Tertiary
A
Angiosperms (flowering plants)
Monocotyledons
Sphenopsids (horsetails)
Gnetales
C
Cretaceous
B
Jurassic
Herbaceous lycopods
Cycads
Triassic
Ferns
Conifers
Mesozoic
Permian
Arborescent lycopods
Seed ferns
Carboniferous
Devonian
Progymnosperms
D
Silurian
Zosterophyllum
Rhynia-type plants
E
Chlorophyte ancestors

	A	B	C	D	E
1.	Green algae	Cycads	Dicotyledons	Psilophyton	Rhynia type plants

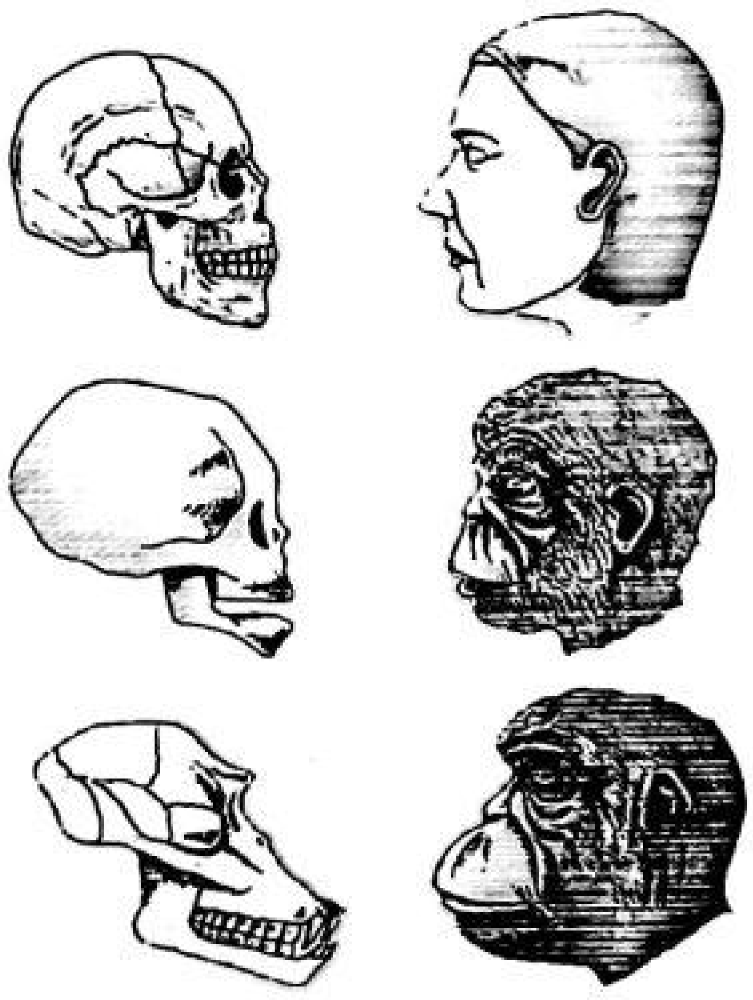
2.	Red algae	Ginkgos	Dicotyledons	Pines	Chlorophyte ancestors
3.	Bryophytes	Ginkgos	Pines	Psilophyton	Tracheophyte ancestors
4.	Bryophytes	Ginkgos	Dicotyledons	Psilophyton	Tracheophyte ancestors

159 Identify A-F in the figure showing the representative evolutionary history of vertebrates through geological periods:


Birds
Lizards
Tuataras
Turtles
Snakes
Crocodiles
Mammals
Quaternary
Tertiary
Cretaceous
Jurassic
Triassic
Permian
Carboniferous
0
50
100
150
200
250
300
350
F
E
D
C
A
B
Early reptiles (extinct)

	A	B	C	D	E	F
1.	Thecodonts	Sauropsids	Therapsids	Synapsids	Pelycosaurs	Dinosaurs
2.	Synapsids	Pelycosaurs	Sauropsids	Dinosaurs	Therapsids	Thecodonts
3.	Sauropsids	Synapsids	Pelycosaurs	Thecodonts	Therapsids	Dinosaurs
4.	Therapsids	Synapsids	Pelycosaurs	Dinosaurs	Sauropsids	Thecodonts

160 A comparison of the skulls of adult modern human beings, baby chimpanzees, and adult chimpanzees is shown.



Statement I:	The skull of the baby chimpanzee is more like an adult human skull than an adult chimpanzee skull.
Statement II:	Infants of both species have large craniums and small faces.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

FAT MCQ's (UNIT VI & VII) - ANSWER KEY

1.	(1)	2.	(3)	3.	(1)	4.	(2)	5.	(1)	6.	(4)	7.	(3)	8.	(1)	9.	(4)	10.	(1)
11.	(3)	12.	(2)	13.	(2)	14.	(1)	15.	(3)	16.	(1)	17.	(4)	18.	(2)	19.	(2)	20.	(3)
21.	(2)	22.	(2)	23.	(1)	24.	(2)	25.	(4)	26.	(2)	27.	(1)	28.	(1)	29.	(1)	30.	(2)
31.	(4)	32.	(3)	33.	(4)	34.	(1)	35.	(2)	36.	(3)	37.	(4)	38.	(4)	39.	(1)	40.	(1)
41.	(3)	42.	(3)	43.	(2)	44.	(1)	45.	(1)	46.	(3)	47.	(4)	48.	(2)	49.	(4)	50.	(3)
51.	(1)	52.	(2)	53.	(3)	54.	(1)	55.	(4)	56.	(4)	57.	(2)	58.	(2)	59.	(1)	60.	(4)
61.	(3)	62.	(1)	63.	(1)	64.	(4)	65.	(1)	66.	(2)	67.	(3)	68.	(3)	69.	(2)	70.	(3)
71.	(3)	72.	(2)	73.	(2)	74.	(3)	75.	(4)	76.	(1)	77.	(3)	78.	(4)	79.	(2)	80.	(1)
81.	(2)	82.	(3)	83.	(2)	84.	(3)	85.	(4)	86.	(2)	87.	(1)	88.	(4)	89.	(1)	90.	(4)
91.	(4)	92.	(3)	93.	(3)	94.	(1)	95.	(3)	96.	(1)	97.	(1)	98.	(1)	99.	(3)	100.	(3)
101.	(1)	102.	(4)	103.	(1)	104.	(2)	105.	(1)	106.	(1)	107.	(1)	108.	(4)	109.	(4)	110.	(2)
111.	(4)	112.	(1)	113.	(1)	114.	(4)	115.	(1)	116.	(2)	117.	(2)	118.	(1)	119.	(3)	120.	(2)
121.	(1)	122.	(1)	123.	(3)	124.	(1)	125.	(2)	126.	(3)	127.	(3)	128.	(4)	129.	(1)	130.	(1)
131.	(2)	132.	(2)	133.	(3)	134.	(1)	135.	(1)	136.	(1)	137.	(2)	138.	(4)	139.	(2)	140.	(2)
141.	(3)	142.	(2)	143.	(1)	144.	(2)	145.	(3)	146.	(4)	147.	(1)	148.	(3)	149.	(4)	150.	(1)
151.	(4)	152.	(1)	153.	(3)	154.	(2)	155.	(1)	156.	(1)	157.	(1)	158.	(4)	159.	(3)	160.	(2)

HUMAN HEALTH AND DISEASE

INTRODUCTION

1 The term 'Health' is defined in many ways. The most accurate definition of health would be:

1. Health is the state of body and mind in a balanced condition
2. Health is the reflection of a smiling face
3. Health is a state of complete physical, mental and social well-being
4. Health is the symbol of economic prosperity.

2 Identify a non-infectious disease amongst the following:

1.	Malaria	2.	Hemophilia
3.	AIDS	4.	Hepatitis

3 Diseases are broadly grouped into infectious and non-infectious diseases. In the list given below, identify the infectious diseases.

i.	Cancer	ii.	Influenza
iii.	Allergy	iv.	Smallpox

Options:

1.	i and ii	2.	ii and iii
3.	iii and iv	4.	ii and iv

COMMON DISEASES IN HUMANS

4 The organisms which cause diseases in plants and animals are called:

1.	Pathogens	2.	Vectors
3.	Insects	4.	Worms

5 Consider the following two statements:

I: Most parasites are pathogens.
II: Pathogens have to adapt to life within the environment of the host.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. Only **I** is correct
4. Only **II** is correct

6 Identify the correct statement regarding typhoid fever in human beings:

1. It is caused by a pathogenic protozoan *Salmonella typhi*
2. The pathogen remains confined to the small intestine
3. Widal test can confirm the infection very early in the disease
4. Intestinal perforation and death may occur in severe cases

7 The clinical test that is used for the diagnosis of typhoid is:

1.	ELISA	2.	ESR
3.	PCR	4.	Widal

8 The name Mary Mallon is associated with:

1.	Tuberculosis	2.	Typhoid
3.	Leprosy	4.	Rabies

9 How many of the given statements are correct?

I: *Salmonella typhi* is a pathogenic bacterium which causes typhoid fever in human beings.
II: These pathogens generally enter the small intestine through food and water contaminated with them
III: The pathogen remains confined to the small intestine.
IV: Intestinal perforation and death may occur in severe cases.
V: Typhoid fever could be confirmed by Widal test.

1. 2
2. 3
3. 4
4. 5

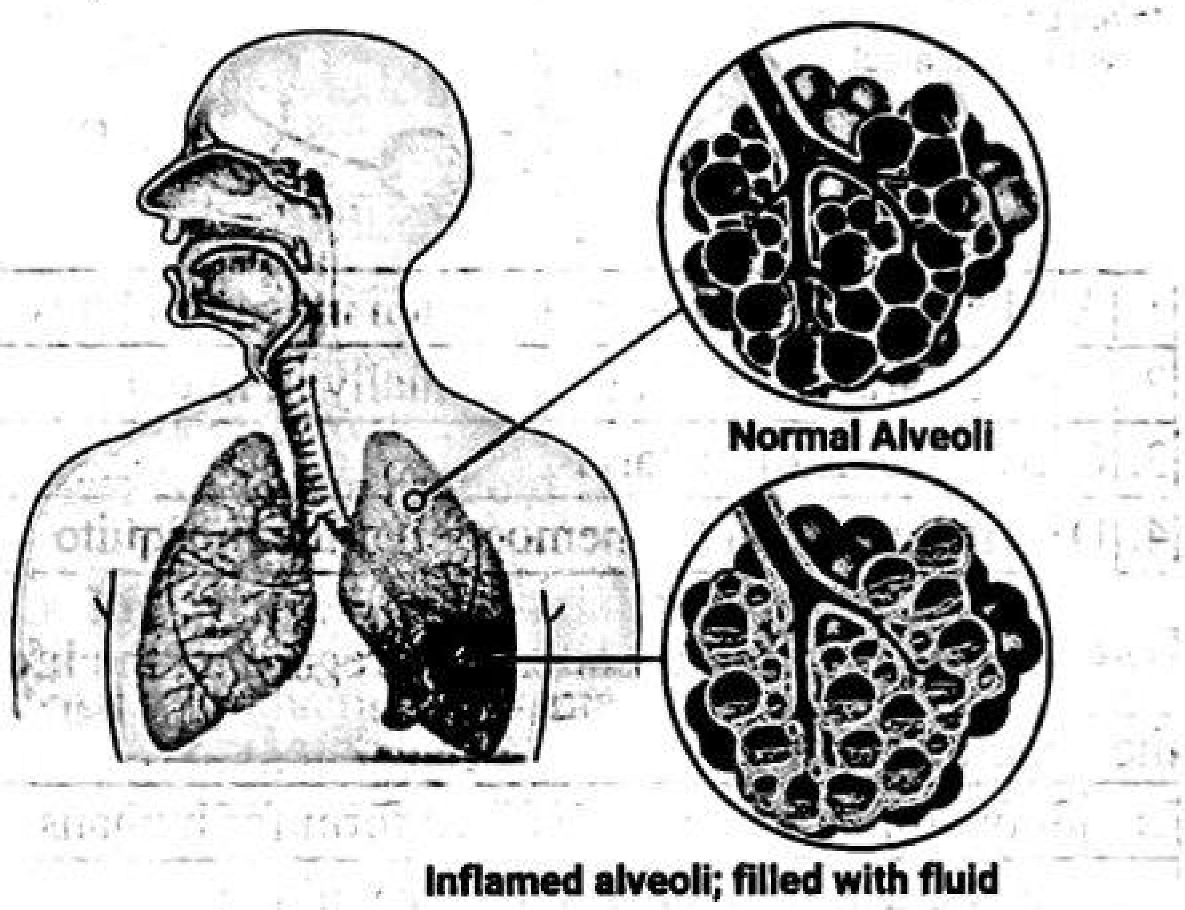
10 A common cause of pneumonia in humans is:

1.	*Streptococcus pyogenes*	2.	*Hemophilus influenzae*
3.	*Staphylococcus aureus*	4.	Rotavirus

11 Many diseases can be diagnosed by observing the symptoms in the patient. Which group of symptoms are indicative of pneumonia?

1.	Difficulty in respiration, fever, chills, cough, headache
2.	Constipation, abdominal pain, cramps, blood clots
3.	Nasal congestion and discharge, cough, constipation, headache
4.	High fever, weakness, stomach pain, loss of appetite and constipation

12 The given diagram shows a lung condition where breathing is difficult; fever, chills, cough and headache are common symptoms and in severe cases, the lips and finger nails may turn gray to bluish in colour. The condition is most likely:



1.	Emphysema	2.	Bronchial Asthma
3.	Pneumonia	4.	Pneumoconiosis

13 Which pair of the given bacteria can commonly cause pneumonia in humans?

1.	*Streptococcus pneumoniae and Staphylococcus aureus*
2.	*Haemophilus influenzae and Streptococcus pneumoniae*
3.	*Pneumocystis carinii and Mycoplasma hominis*
4.	*Streptococcus pyogenes and Bacillus anthracis*

14 A person can get pneumonia by:

I:	Droplet transmission
II:	Through articles used by an infected person
III:	Arthropod vectors

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

15 All the following diseases can be caused by a bacterial infection except:

1.	Dysentery	2.	Diphtheria
3.	Plague	4.	African sleeping sickness

16 Which of the following statements will not be true regarding common cold?

1.	Rhino viruses cause the common cold.
2.	Rhino viruses infect the nose and respiratory passage and frequently involve the lungs.
3.	The common cold is characterised by nasal congestion and discharge, sore throat, hoarseness, cough, headache and tiredness.
4.	It spreads though droplets and through contaminated objects.

17 Common cold is caused in humans by an infection with:

1. Arbovirus
2. Rhinovirus
3. Paramyxovirus
4. Orthomyxovirus

18 Unlike pneumonia, common cold virus generally does not affect:

1.	Lungs	2.	Nasal cavity
3.	Nasopharynx	4.	Pharynx

19 Consider the two statements:

Assertion (A):	Social distancing, wearing facial mask, and repeated hand washing are important preventive measures to check the spread of infections like COVID-19.
Reason (R):	Infections like COVID-19 are spread by droplet.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

20 In the human body, the malaria parasite first multiplies in:
1. RBC
2. Hepatocytes
3. Hepatic sinusoids
4. Lymphocytes in secondary lymphoid organs

21 The occurrence of chills and fever in malaria is associated with:

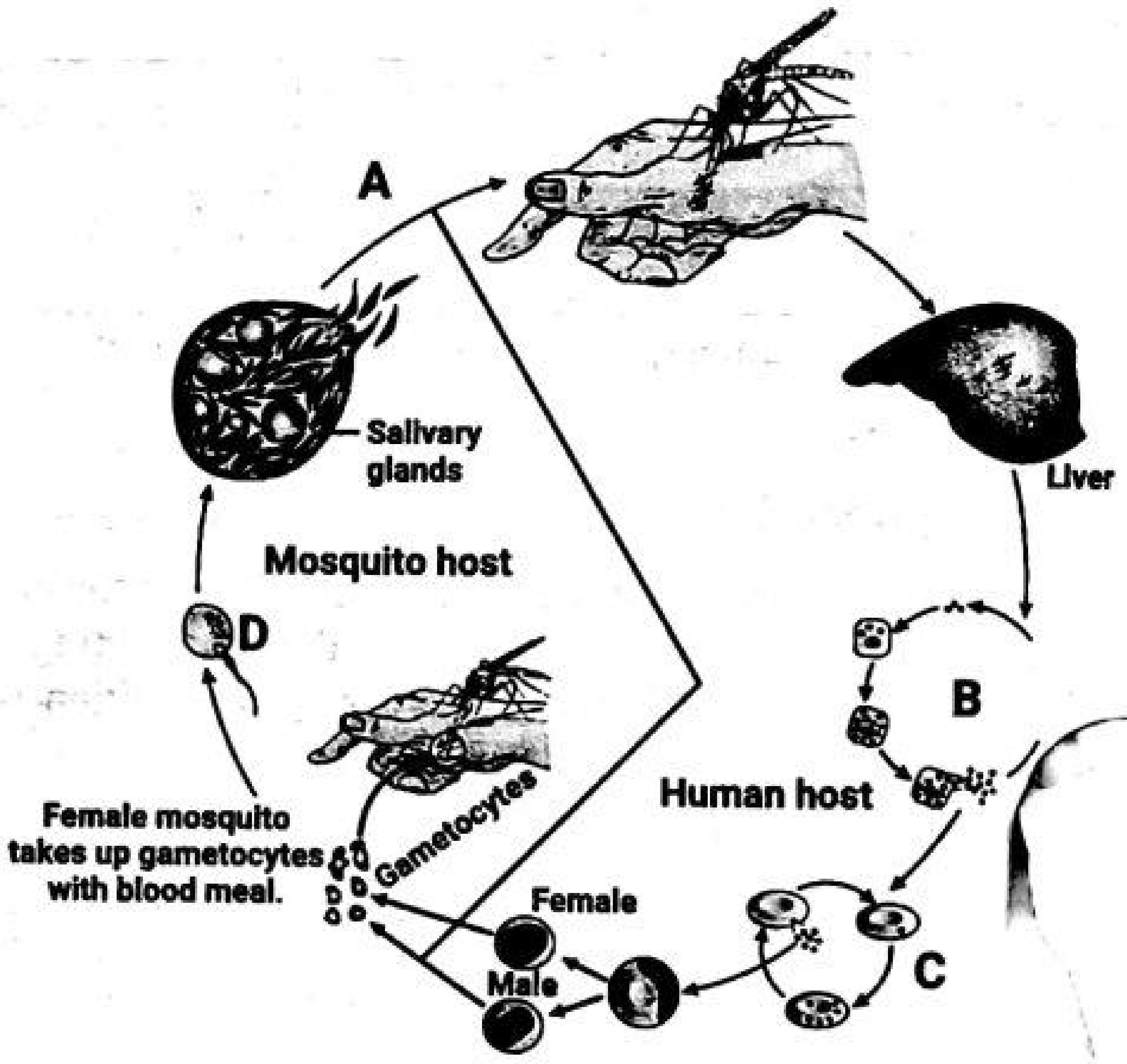
1.	Rupture of hepatocytes during exo-erythrocytic cycle of the parasite
2.	Inoculation of the sporozoite by the mosquito bite into humans
3.	Release of haemozoin due to rupture of RBCs by the parasite
4.	Development of the adult trophozoite in the RBC

22 The sporozoites that cause infection when a female *Anopheles* mosquito bites a person, are found in:
1. liver of the person
2. RBCs of mosquito
3. salivary glands of the mosquito
4. gut of the mosquito

23 Haemozoin is a:

1.	precursor of hemoglobin
2.	toxin released from *Streptococcus* infected cells
3.	toxin released from *Plasmodium* infected cells
4.	toxin released from Haemophilus infected cells

24 Consider the given stages in the life cycle of *Plasmodium* and choose the correctly matched pair:



1.	A	Merozites infect humans when mosquito bites
2.	B	The parasite reproduces sexually in liver cells
3.	C	Symptoms of malaria
4.	D	Fertilization in the hemocoel of the mosquito

25 Identify the correct statements regarding the life cycle the malarial parasite:

I:	Sporozoites are the infectious form for humans.
II:	The parasites initially multiply within the red blood cells and then attack the liver cells.
III:	The rupture of RBCs is associated with release of a toxic substance, haemozoin, which is responsible for the chill and high fever recurring every three to four days.
IV:	Fertilization occurs in human RBCs

1. **I** and **II** only
2. **II** and **III** only
3. **II** and **IV** only
4. **I** and **III** only

26 During the life cycle of malaria, where does the fertilization take place?

1. In human RBC
2. In human hepatocytes
3. In the gut of the mosquito
4. In the salivary gland of the mosquito.

27 What stage of the development of the malarial parasite is infective to man?

1.	Merozoite	2.	Sporozoite
3.	Ookinete	4.	Hypnozoite

28 Which of the following measures is most effective in the prevention of malaria?

1. Vaccination against the malaria parasite.
2. Use of bed nets treated with insecticides.
3. Taking antibiotics regularly.
4. Use of repellents to kill adult mosquitoes.

29 Sickle cell trait makes a person:

1. more prone to severe malaria
2. more prone to severe typhoid
3. less prone to severe malaria
4. less prone to severe typhoid

30 The life cycle of the malarial parasite includes:

1.	Asexual reproduction in humans and sexual reproduction in mosquitoes
2.	Sexual reproduction in humans and asexual reproduction in mosquitoes
3.	Asexual reproduction occurring only in the liver cells of humans
4.	Sexual reproduction occurring only in the red blood cells of humans

31 All the following are true regarding *Entamoeba histolytica* except:

1.	is a protozoan parasite
2.	causes amoebic dysentery
3.	can be mechanically carried by rodents and dogs
4.	is mainly transmitted through drinking water and food contaminated by the faecal matter

32 A healthy person acquires *Ascaris* infection through:

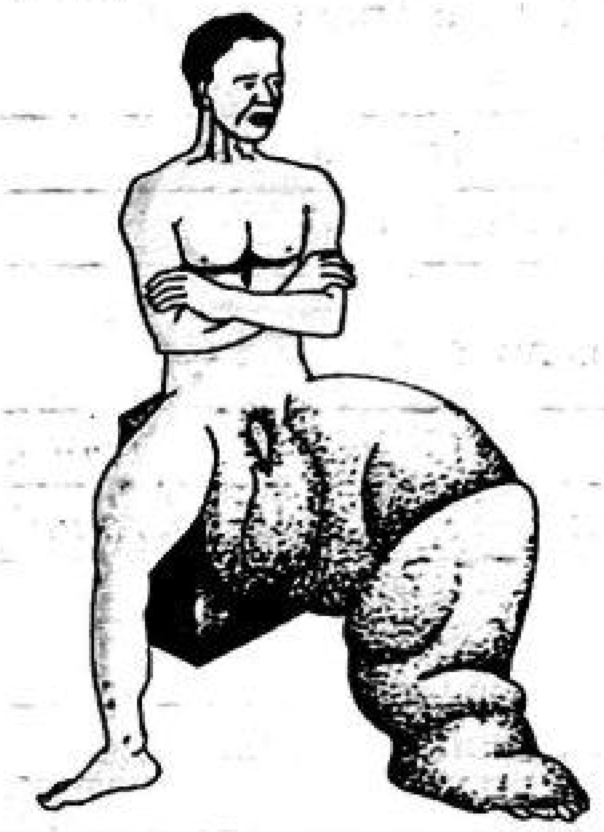
1.	Droplet
2.	Direct contact
3.	Contaminated water, vegetables, fruits, etc.
4.	Mosquito Vector

33 Regarding Ascariasis:

I:	It is caused by a nematode.
II:	It is transmitted through arthropod vectors.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

34 The diagram shows inflammation in one of the lower limbs due to an infection by a certain pathogen. Identify the correct statement:



Statement I:	This is caused by the Annelid Wuchereria bancrofti.
Statement II:	The condition is due to the blockage of deep veins by the adult worm.

1.	Only **Statement I** is correct
2.	Only **Statement II** is correct
3.	Both **Statement I** and **Statement II** are correct
4.	Both **Statement I** and **Statement II** are incorrect

35 *Wuchereria (W. bancrofti* and *W. malayi),* the filarial worm affect:

1.	lungs	2.	large intestines
3.	lymphatic system	4.	brain

36 Regarding Filariasis:

I:	It is caused by a flatworm.
II:	It is transmitted through arthropod vectors.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

37 Consider the given two statements:

Assertion (A):	Massive swelling in the limbs is a common symptom of filariasis.
Reason (R):	It is caused by the immune reaction to the filarial worms clogging the lymphatic system.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

38 Ringworm is not caused by:

1.	*Trichoderma*	2.	*Microsporum*
3.	*Trichophyton*	4.	*Epidermophyton*

39 Ringworm:

I:	is a fungal infection of the skin.
II:	is typically caused by *Trichoderma, Macrosporum,* or *Epicoccum*

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

40 For diseases transmitted through insect vectors, the most important measure to control the spread will be:

1.	to control or eliminate the vectors and their breeding places.
2.	to vaccinate people residing in the area.
3.	to wear proper clothes to cover the exposed areas.
4.	biocontrol by pathogens

41 Which of the following is also sometimes called as mosquito fish?

1.	Bombay duck	2.	*Gambusia*
3.	Pacific salmon	4.	Pomfret

42 What is the causative agent of dengue fever in humans?

1. *Aedes aegypti* mosquito
2. A virus
3. A bacterium
4. Prion

43 The disease chikungunya is transmitted by:

1.	house fly	2.	*Aedes* mosquito
3.	cockroach	4.	female *Anopheles*

44 How many of the diseases given in the box are infectious diseases?

Influenza, Asthma, Small pox, Allergy, Plague, Tetanus, Herpes, Diabetes

1. 2
2. 3
3. 4
4. 5

45 Polio, diphtheria, pneumonia and tetanus:

1.	are all bacterial diseases
2.	are transmitted by arthropod vectors
3.	have been controlled to a large extent by the use of vaccines
4.	are invariably fatal

IMMUNITY

46 What is incorrect regarding innate immunity?

1.	It is present at the time of birth
2.	Physiological barriers prevent microbial growth
3.	Natural killers, a cellular barrier, are a type of monocyte
4.	It is a non-specific type of defense

47 An anatomical barrier available in innate immune response in humans is:

1. Skin and mucus membrane
2. Presence of HCl in gastric secretions
3. Phagocytes in tissues
4. Secretion of interferons

48 Match each item in Column I [Barriers in innate immunity] with one in Column II [Example] and select your answer from the codes given:

	Column I		Column II
A.	Physical	a.	Skin and mucus membranes
B.	Physiological	b.	PMNL
C.	Cellular	c.	Acid in stomach and saliva in mouth
D.	Cytokine	d.	Interferon

Codes

Options:	A	B	C	D
1.	a	b	c	d
2.	d	b	c	a
3.	a	c	b	d
4.	d	c	b	a

49 A physiological barrier available in innate immune response in humans is:

1.	Skin and mucus membrane
2.	Presence of HCl in gastric secretions
3.	Phagocytes in tissues
4.	Secretion of interferons

50 The main phagocytes in our body are:

1. Basophils and Acidophils
2. Neutrophils and Macrophages
3. NK cells and Mast cells
4. Dendritic cells and Glial cells

51 Which of the following cells can phagocytose microbes only in tissues?

1.	Neutrophil	2.	Natural killer cells
3.	Macrophages	4.	Monocytes

52 Non-specific response to microbes that enter the human body involves the response of all the following except:

1.	T lymphocyte	2.	Neutrophil
3.	Macrophage	4.	Natural Killer cell

53 Interferons are secreted by:

1.	Virus infected cells	2.	The viruses themselves
3.	Natural killer cells	4.	T helper cells

54 Interferons:

1. cause the lysis of bacterial cells
2. fragment bacterial DNA
3. help phagocytes recognize microbes
4. prevent viral replication

55 Consider the given two statements:

Assertion (A):	Interferons are released by virus-infected cells and help other cells resist the virus.
Reason (R):	Interferons prevent the multiplication of viruses

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

56 Consider the given two statements:

I:	Acquired immunity is not pathogen specific.
II:	Acquired immunity is characterised by memory.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

57 Anamnestic response in acquired immunity is due to the fact that it is:

1.	characterized by memory	2.	pathogen specific
3.	huge in magnitude	4.	due to lymphocytes

58 What word correctly denotes an enhanced reaction of the body's immune system to an antigen which is related to one previously encountered?

1.	Booster	2.	Primary
3.	Anamnestic	4.	Magnified

59 Consider the given two statements:

I:	The acquired immune response is called "adaptive".
II:	In acquired immunity, pathogen-specific receptors are "acquired" during the lifetime of the organism.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct and **II** is incorrect.
4. Both **I** and **II** are incorrect.

60 B cells:

1.	Do not produce antibodies but help T cells produce them
2.	Are pathogen specific but do not retain the memory of previous encounters
3.	Lack ability to distinguish between self and non-self
4.	Are involved in humoral immune response

61 In an antibody molecule, an antigen binding site is located:

1. In the constant portion
2. At the C – terminus of a heavy chain
3. Between a light and a heavy chain
4. Between two heavy chains

62 Identify the incorrect statement regarding the cell-mediated immune response:

1.	It is mediated through the T lymphocytes
2.	A large number of antibodies are secreted by activated T cytotoxic cells
3.	It responds against cancer cells and viral infections
4.	It is responsible for graft rejection

63 Transplantation of tissues/organs to save certain patients often fails due to the rejection of such tissues/organs by the patient. Which type of immune response is responsible for such rejections?

1. auto-immune response
2. humoral immune response
3. physiological immune response
4. cell-mediated immune response

64 Which of the following is the correct description of the relation between T cells and B cells?

1.	Both are processed in bone marrow and respond to antigen from thymus
2.	T cells help B cells produce antibodies
3.	B cells increase the phagocytic capabilities of T cells
4.	While B cells are involved in first response to an antigen, T cells respond to subsequent encounters with the same antigen

65 A monovalent antibody molecule can be represented as:

1.	H_5N_1	2.	H_1L_1
3.	H_2L_2	4.	H_1N_1

66 Consider the two statements:

I:	The arm of the acquired immunity due to B lymphocytes is called as the humoral response.
II:	B cells, upon differentiation into plasma cells, secrete antibodies that are present in the blood.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. Only **II** is correct.
4. Both **I** and **II** are incorrect.

67 Memory cells:

I:	are produced in humoral immune response
II:	are produced in cell mediated immune response
III:	are responsible for passive immunity

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

68 The cell mediated immune response:

I:	is mediated by T lymphocytes.
II:	produces more antibodies than in the humoral immune response.
III:	is characterised by memory.
IV:	is responsible for graft rejections.

1. Only **I, II** and **III** are correct
2. Only **I, III** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

69 Which of the following is incorrect regarding acquired immunity?

1.	It is a function of lymphocytes
2.	It retains memory of previous encounters with pathogens
3.	It is non-specific and present since birth
4.	It has the ability to distinguish between self and non-self

70 Active immunity develops when:

1.	A host is exposed to antigens
2.	Antigen presenting cells first encounter the antigen
3.	T helper cells activate B cells to produce antibodies
4.	When a child gets vaccinated for the first time

71 A foetus receiving some antibodies from mother through placenta is an example of:

1.	Naturally acquired active immunity
2.	Artificially acquired active immunity
3.	Artificially acquired passive immunity
4.	Naturally acquired passive immunity

72 Antibodies present in colostrum protects the newborn from certain diseases which are of:

1.	Ig G type	2.	Ig A type
3.	Ig D type	4.	Ig E type

73 What type of immunity is used in the treatment of a patient of snakebite?

1.	Naturally acquired active immunity
2.	Artificially acquired active immunity
3.	Artificially acquired passive immunity
4.	Naturally acquired passive immunity

74 A person has a contaminated wound after a road traffic accident. He has not received tetanus toxoid in his life and was given tetanus immunoglobulin. The type of immunity that will be conferred to this person will be:
1. passive natural immunity.
2. active natural immunity.
3. active artificial immunity.
4. passive artificial immunity.

75 A person gets infected by a pathogen and is now recovering from the disease. The type of immunity developed would be:

1.	naturally acquired active immunity
2.	artificially acquired active immunity
3.	artificially acquired passive immunity
4.	naturally acquired passive immunity

76 Which of the following is a recombinant vaccine?

1.	BCG	2.	OPV
3.	Hepatitis B	4.	MMR

77 An infant can get passive immunity from:

1.	infection	2.	colostrum
3.	anti-Rh Ig	4.	vaccination with live vaccines

78

Assertion (A):	Passive immunity is longer-lasting than active immunity.
Reason (R):	In passive immunity, an infection by a pathogen induces the formation of antibodies in the host.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is False

79 Consider the given two statements:

Assertion(A):	Active immunisation provides long-lasting immunity, while passive immunisation offers short-term protection.
Reason(R):	Active immunisation stimulates the body's own immune response to develop memory cells, whereas passive immunisation introduces pre-formed antibodies.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

80 The class of antibodies involved in allergic response is:

1.	IgA	2.	IgG
3.	IgE	4.	IgM

81 Allergies:

I:	are caused by hypersensitivity of the immune system to typically harmless substances in the environment.
II:	involve immunoglobulin E antibodies

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

82 The mediator of inflammation, histamine, is secreted in tissues by:

1.	basophils	2.	monocytes
3.	mast cells	4.	macrophages

83 Relief in allergic reactions can be provided by the use of all of the following except:

1.	Anti-histamines	2.	Steroids
3.	Adrenaline	4.	Antibiotics

84 Consider the given two statements:

Assertion (A):	Histamine is used to treat allergies.
Reason (R):	Histamine is a vasoconstrictor.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is False

85 The causation of 'auto-immune' disorders in humans is based on:

I:	'memory' of the immune system.
II:	ability to distinguish between self and non-self.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

86 Rheumatoid arthritis is:

1. X – linked recessive disorder
2. Congenital disorder
3. A viral infection
4. An auto-immune disorder

87 Which of the following is not an auto-immune disorder in humans?

1.	Rheumatoid arthritis	2.	Myasthenia gravis
3.	Emphysema	4.	Graves' disease

88 Regarding rheumatoid arthritis:

I:	Rheumatoid arthritis (RA) is a chronic autoimmune disorder.
II:	In rheumatoid arthritis, the body's immune system attacks its own tissue, including joints.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

89 Primary lymphoid organs are:

1.	Bone marrow & Spleen	2.	Bone marrow & Thyroid
3.	Lymph nosed & Spleen	4.	Bone marrow & thymus

90 Identify the incorrect statement:

1.	The primary lymphoid organs are bone marrow and thymus.
2.	Peyer's patches are masses of lymphoid tissue in small intestine.
3.	All blood cells excluding lymphocytes are produced in bone marrow.
4.	Thymus regresses in size with age.

91 The secondary lymphoid organs:

I:	include bone marrow and thymus.
II:	provide the sites for the interaction of lymphocytes with the antigen.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

92 Where do the T-lymphocytes develop the ability to recognize self from non-self antigens?

1.	plasma cells	2.	spleen
3.	thymus	4.	liver

93 The microenvironment for the development and maturation of T lymphocytes is provided by:

I. Bone marrow
II. Thymus
III. Spleen

1.	Only **II**	2.	Only **III**
3.	Only **I** and **II**	4.	**I, II** and **III**

94 Which endocrine gland is important for the development of acquired immunity in human beings?

1. Pineal
2. Pituitary
3. Thymus
4. Thyroid

95 Which of the following is not a function of spleen?

1.	It acts as a filter of the blood by trapping blood-borne microorganisms
2.	It acts as a large reservoir of RBCs
3.	It filters our old RBCs
4.	It continues to form RBCs for a few years after birth

96 What constitutes about 50% of the lymphoid tissue in the human body?

1.	Malt	2.	Spleen
3.	Lymph nodes	4.	Liver

AIDS

97 How many of the given statements regarding HIV/AIDS are true?

I.	AIDS is a congenital disease
II.	Syndrome means a group of symptoms
III.	HIV is a rotavirus
IV.	HIV does not have an envelope
V.	HIV can be transmitted by an infected mother to her child through placenta

1.	2	2.	3
3.	4	4.	5

98 What is not correct regarding the pathogenesis of AIDS in humans?

I:	HIV first enters into the macrophages.
II:	Macrophages are used by HIV as a factory to produce more virus particles.
III:	The viral cDNA does not get integrated into any cells in the human body.
IV:	HIV also enters the T-helper cells and destroys them.
V:	The anti-retroviral treatment for AIDS is completely curative.

1.	All except **V**	2.	Only **III** and **V**
3.	Only **I, III** and **IV**	4.	All

99 HIV selectively infects and destroys:

1.	CD4 T Lymphocytes	2.	CD8 T Lymphocytes
3.	T-Suppressor cells	4.	B-Lymphocytes

100 AIDS is caused by HIV. Among the following, which one is not a mode of transmission of HIV?

1.	Transfusion of contaminated blood
2.	Sharing the infected needles
3.	Shaking hands with infected persons
4.	Sexual contact with infected persons

101 After a few years of being diagnosed with HIV infection, a person develops tuberculosis, toxoplasmosis, diarrhea, and significant weight loss. This is most likely due to:

1.	A cytokine storm in the body
2.	A decrease in B lymphocytes count
3.	A decrease in T helper cells count
4.	A side effect of anti-retroviral therapy given

102 Consider the following statements:

I:	HIV is a retrovirus.
II:	It infects and destroys the CD4 T-lymphocytes.
III:	The newer antiretroviral drugs are a cure for HIV infection.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

103 *Toxoplasma,* an organism commonly causing opportunistic infection in AIDS patients is a/an:

1. autotrophic bacterium
2. fungus
3. protozoan
4. helminth

104 After getting into the body of the person, the fi cells that HIV uses as HIV factory are:

1. T cytotoxic cells
2. T helper cells
3. Macrophages
4. Dendritic cells

105 A widely used diagnostic test for AIDS is:

1.	ELISA	2.	VDRL
3.	Schick's test	4.	TORCH

106 Time lag between the infection and appearance of AIDS symptoms may vary from:

1.	a few months to many years (usually 5-10 years).
2.	a few months to a few years (usually 1-2 years).
3.	a few days to many months (usually 10 – 12 months).
4.	a few days to a few weeks (usually 5-10 weeks).

107 Consider the given two statements:

Assertion (A):	It is very important that the HIV/AIDS infected persons are not isolated from family and society.
Reason (R):	HIV/AIDS is not an infectious disease.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains Assertion.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

108 AIDS has no

I: cure
II: treatment
1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

109 After getting into the body of the person, HIV:

1. enters into macrophages, where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase.
2. enters into T helper cells, where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase.
3. enters into macrophages, where DNA genome of the virus replicates to form viral RNA with the help of the enzyme RNA polymerase.
4. enters into T helper cells, where DNA genome of the virus replicates to form viral RNA with the help of the enzyme RNA polymerase

110 AIDS is caused by the Human Immuno deficiency Virus (HIV), which:

1. is a member of a group of viruses called reoviruses
2. lacks an envelope
3. has double stranded RNA genome
4. is a member of a group of viruses called retroviruses

111 Both AIDS and Hepatitis B:

A: are chronic infections and ultimately fatal
B: can be transmitted through sexual contact or infected blood
1. Only A is correct
2. Only B is correct
3. Both A and B are correct
4. Both A and B are incorrect

112 Which of the following steps correctly describes the replication cycle of HIV, a retrovirus, within a host cell?

1. HIV enters the host cell, directly integrates its RNA into the host's DNA, and then begins synthesizing viral proteins.
2. After entering the host cell, HIV uses its reverse transcriptase enzyme to convert its RNA genome into DNA, which then integrates into the host's DNA.
3. HIV injects its proteins into the host cell, causing the host's own replication machinery to produce viral RNA from its DNA.
4. The virus attaches to the host cell, immediately causes the cell to lyse, and uses the released organelles to assemble new viruses.

113 Identify the incorrectly matched pair:

1.	CT	Computed Tomography
2.	MRI	Magnetic Radiation Imaging
3.	NACO	National AIDS Control Organization
4.	MALT	Mucosa Associated Lymphoid Tissue

CANCER

114 Cancer is :

1. a disease caused by DNA viruses
2. caused by the multiplicity of virulent infections
3. a genetic disease caused by multiple mutational events
4. a hazard due to the occupation of an individual

115 Cancer cells exhibit:

1. Contact inhibition
2. Low division rate
3. Metastasis
4. High degree of differentiation

116 Metastasis shown by malignant tumors:

1. is due to contact inhibition exhibited by cells.
2. causes cells to remain undifferentiated.
3. makes cancer cells susceptible to be killed by radiation.
4. can start secondary tumors at distant sites in the body.

117 Cancer causing genes are called:

1. structural genes
2. expressor genes
3. oncogenes
4. regulatory genes

118 A tumor that invades surrounding tissues is usually capable of producing metastases, may recur after attempted removal, and is likely to cause death unless adequately treated. Such a tumor is called a:

1.	Benign tumor	2.	Malignant tumor
3.	Teratoma	4.	Secondary tumor

119 A normal cellular gene which when altered by mutation can contribute to cancer is called:

1.	Oncogene	2.	V – Onc
3.	Neoplastic gene	4.	Proto-oncogene

120 Cancer detection is mainly based on:

1.	Radiography	2.	Ultrasonography
3.	Magnetic resonance imaging	4.	Histopathology

121 Regarding carcinogens:

I:	Almost all carcinogens are mutagens.
II:	X-rays and Gamma rays are non-ionising.
III:	UV rays are ionising radiations.

1. Only **I** is correct
2. Only **II** and **III** are correct
3. Only **III** is correct
4. **I, II,** and **III** are correct

122 Identify the incorrect statement:

1.	Leukaemias are diagnosed by blood and bone marrow tests.
2.	CT scan uses X rays.
3.	MRI uses ionising radiation and strong magnetic fields.
4.	Antibodies against cancer-specific antigens can be used for the detection of certain cancers.

123 In malignant tumors, the cells proliferate, grow rapidly, and move to other parts of the body to form new tumors. This stage of the disease is called:

1.	metagenesis	2.	metastasis
3.	teratogenesis	4.	mitosis

124 Given below are two statements:

Assertion (A):	Most cancers are treated by a combination of surgery, radiotherapy, and chemotherapy
Reason (R):	Combination therapy is curative for all types of cancers

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

125 Consider the given two statements:

Statement I:	Computed tomography uses X-rays to generate a three-dimensional image of the internals of an object.
Statement II:	MRI uses strong magnetic fields and non-ionising radiations to accurately detect pathological and physiological changes in the living tissue.

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is incorrect; **Statement II** is incorrect
3.	**Statement I** is correct; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is correct

126 Consider the given two statements:

Assertion (A):	Early detection of cancers is essential.
Reason (R):	It allows the disease to be treated successfully in many cases.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

127 Consider the given two statements:

Assertion (A):	Techniques of molecular biology may be very helpful in prevention of certain cancers.
Reason (R):	Techniques of molecular biology can be applied to detect genes in individuals with inherited susceptibility to certain cancers.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

128 Consider the given two statements:

Assertion (A):	Many cancer patients are given substances called biological response modifiers such as α-interferon.
Reason (R):	Tumor cells have been shown to avoid detection and destruction by immune system.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

129

Assertion (A):	Some viruses can cause cancer.
Reason (R):	Some viruses carry oncogenes.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is False

130 Cancer is characterised by:

A:	Uncontrolled cell division and abnormal growth
B:	Loss of cell differentiation and invasion of healthy tissues
C:	Formation of tumors that are malignant

1. Only **A** and **B**
2. Only **A** and **C**
3. Only **B** and **C**
4. **A, B** and **C**

DRUGS AND ALCOHOL ABUSE

131 Opioids bind to specific receptors in CNS and:

1.	GIT	2.	CVS
3.	Liver	4.	Lungs

132 Diacetyl morphine is commonly known as:

1.	Hashish	2.	Marijuana
3.	Crack	4.	Heroin

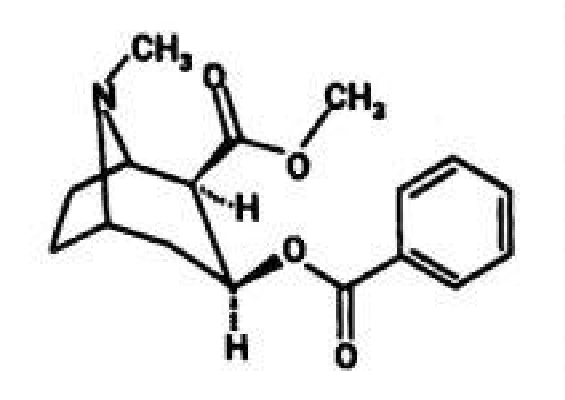
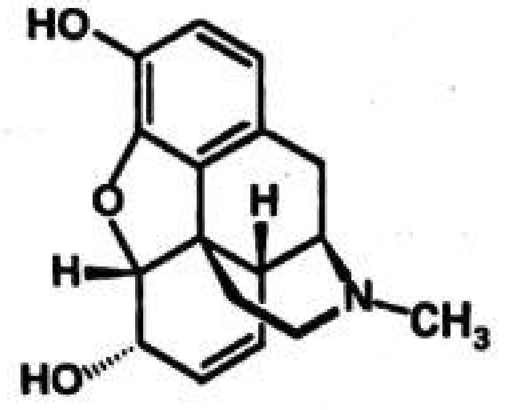
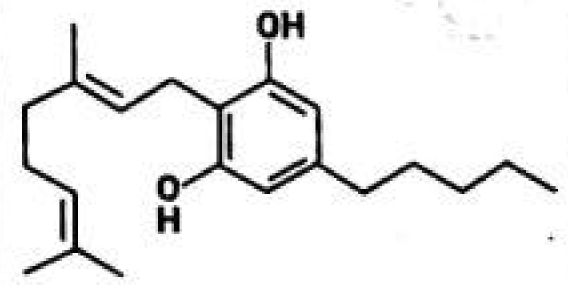
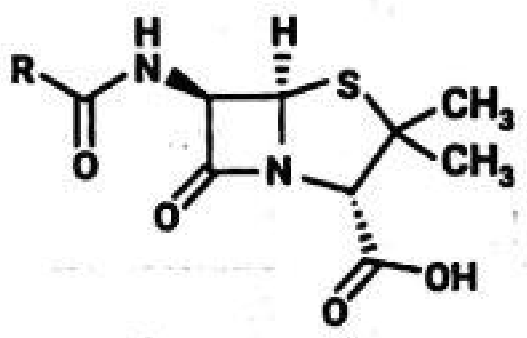
133 'Smack' is a drug obtained from the:

1. latex of *Papaver somniferum*
2. leaves of *Cannabis sativa*
3. flowers of Dhatura
4. fruits of *Erythroxylum coca*

134 Cannabinoid receptors are principally located in the brain but they also have side effects on:

1.	GIT	2.	CVS
3.	Liver	4.	Lungs

135 Which of the following shows the correct chemical structure of morphine?

1.		2.	
3.		4.	

136 Tobacco consumption is known to stimulate the secretion of adrenaline and nor-adrenaline. The component causing this could be:

1.	Nicotine	2.	Tannic acid
3.	Curamin	4.	Catechin

137 Cocaine acts through:

1.	Interfering with the action of acetylcholine
2.	Potentiating catecholamines
3.	Interfering with the transport of dopamine
4.	Releasing endorphins and enkephalins

138 Which of the following is not a hallucinogenic drug?

1.	LSD	2.	Mescaline
3.	Morphine	4.	Hashish

139 Which of the following drugs has a potent stimulating action on CNS, producing a sense of euphoria and increased energy?

1.	Cocaine	2.	Morphine
3.	Barbiturates	4.	Benzodiazepines

140 Erythroxylum coca, Atropa belladonna, and *Datura* innoxia are plants:

1.	that are critically endangered according to the IUCN list.
2.	which have become invasive in Indian ecosystems.
3.	with hallucinogenic properties.
4.	found only in the Himalayan region of the Indian subcontinent.

141 Consider the given two statements:

Assertion (A):	Smoking is associated with increased incidence of cancers of lung, urinary bladder and throat.
Reason (R):	Nicotine, present in tobacco, stimulates adrenal gland to release adrenaline and nor-adrenaline into blood circulation

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

142 Cannabinoids are a group of chemicals used to produce all the following except:

1. Hashish
2. Afeem
3. Charas
4. Ganja

143 Identify the drugs that induce calmness, remov anxiety and can be used as sedatives?

1. Morphine
2. Cocaine
3. Benzodiazepines
4. Datura

144 Anabolic steroids are frequently abused. Their side effects include all of the following except:

1.	Masculinization in females
2.	Mood swings and depression in females
3.	Reduction in size of testicles in males
4.	Reduction in size of the prostate in males

145

Assertion (A):	Anabolic steroids are frequently abused by athletes
Reason (R):	They decrease aggressiveness helping athletes to maintain calm during competitive athletic events

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

146 Which of the following is not an adverse effect of abuse of anabolic steroids in females?

1. masculinisation (features like males)
2. decreased aggressiveness
3. mood swings
4. abnormal menstrual cycles

147 effects of anabolic steroid abuse in males include:

I.	Aggressiveness and behavioral changes
II.	Decreased testicle size and fertility

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

148 Match the following drugs with their corresponding effects on the human body.

	Column I		**Column II**
A.	Barbiturates	P.	Pain Relief
B.	Antibiotics	Q.	Reduced Anxiety
C.	Analgesics	R.	Sleep Induction
D.	Tranquilizers	S.	Bacterial Infection Control

Codes:

	A	**B**	**C**	**D**
1.	R	S	Q	P
2.	P	Q	S	R
3.	P	Q	R	S
4.	R	S	P	Q

149 Consider the given two statements:

Assertion (A):	Smoking causes oxygen deficiency in the body.
Reason (R):	Smoking increases carbon monoxide (CO) content in blood and reduces the concentration of haembound oxygen.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

150 Cirrhosis of liver is a complication of chronic abuse of:

1.	Alcohol	2.	Nicotine
3.	Morphine	4.	Benzodiazepines

151 Which age group is considered as the most vulnerable for the development of drug addiction?

1.	Pre-pubertal	2.	Adolescence
3.	Late adulthood	4.	Geriatric

152 Consider the given two statements:

Statement I:	Addiction is a psychological attachment to certain effects –such as euphoria and a temporary feeling of well-being–associated with drugs and alcohol.
Statement II:	Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued.

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is incorrect; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is correct

153 Consider the given two statements:

Assertion (A):	Chronic drug abuse can lead to the development of tolerance, requiring the user to consume more of the drug to achieve the same effect.
Reason (R):	Drugs stimulate the pleasure center of the brain, making the user dependent on them for feeling pleasure.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

154 Match the following drugs with their source and primary effect.

	Column I		**Column II**
A.	Morphine	1.	Derived from *Cannabis sativa*; used for euphoria
B.	Nicotine	2.	Derived from *Papaver somniferum*; used as a painkiller
C.	Marijuana (THC)	3.	Derived from *Nicotiana tabacum*; stimulates the nervous system
D.	Aspirin	4.	Derived from willow bark; used as an anti-inflammatory

1. A-3, B-4, C-1, D-2
2. A-4, B-1, C-2, D-3
3. A-1, B-2, C-3, D-4
4. A-2, B-3, C-1, D-4

155 Drug abuse is characterised by:

I:	Self-medication
II:	Consuming drugs for non-medicinal purposes
III:	Use in amounts/frequency that impairs one's physical, physiological or psychological functions

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

HUMAN HEALTH AND DISEASE - ANSWER KEY

1.	(3)	2.	(2)	3.	(4)	4.	(1)	5.	(2)	6.	(4)	7.	(4)	8.	(2)	9.	(3)	10.	(2)
11.	(1)	12.	(3)	13.	(2)	14.	(1)	15.	(4)	16.	(2)	17.	(2)	18.	(1)	19.	(1)	20.	(2)
21.	(3)	22.	(3)	23.	(3)	24.	(3)	25.	(4)	26.	(3)	27.	(2)	28.	(2)	29.	(3)	30.	(1)
31.	(3)	32.	(3)	33.	(1)	34.	(4)	35.	(3)	36.	(2)	37.	(1)	38.	(1)	39.	(1)	40.	(1)
41.	(2)	42.	(2)	43.	(2)	44.	(4)	45.	(3)	46.	(3)	47.	(1)	48.	(3)	49.	(2)	50.	(2)
51.	(3)	52.	(1)	53.	(1)	54.	(4)	55.	(1)	56.	(2)	57.	(1)	58.	(3)	59.	(1)	60.	(4)
61.	(3)	62.	(2)	63.	(4)	64.	(2)	65.	(3)	66.	(1)	67.	(1)	68.	(2)	69.	(3)	70.	(1)
71.	(4)	72.	(2)	73.	(3)	74.	(4)	75.	(1)	76.	(3)	77.	(2)	78.	(4)	79.	(1)	80.	(3)
81.	(3)	82.	(3)	83.	(4)	84.	(4)	85.	(2)	86.	(4)	87.	(3)	88.	(3)	89.	(4)	90.	(3)
91.	(2)	92.	(3)	93.	(3)	94.	(3)	95.	(4)	96.	(1)	97.	(1)	98.	(2)	99.	(1)	100.	(3)
101.	(3)	102.	(1)	103.	(3)	104.	(3)	105.	(1)	106.	(1)	107.	(2)	108.	(1)	109.	(1)	110.	(4)
111.	(3)	112.	(2)	113.	(2)	114.	(3)	115.	(3)	116.	(4)	117.	(3)	118.	(2)	119.	(4)	120.	(4)
121.	(1)	122.	(3)	123.	(2)	124.	(3)	125.	(3)	126.	(1)	127.	(1)	128.	(1)	129.	(1)	130.	(4)
131.	(1)	132.	(4)	133.	(1)	134.	(2)	135.	(2)	136.	(1)	137.	(3)	138.	(3)	139.	(1)	140.	(3)
141.	(4)	142.	(2)	143.	(3)	144.	(4)	145.	(3)	146.	(2)	147.	(3)	148.	(4)	149.	(1)	150.	(1)
151.	(2)	152.	(3)	153.	(1)	154.	(4)	155.	(4)										

MICROBES IN HUMAN WELFARE

INTRODUCTION

1 In the chapter 'Microbes in Human Welfare', the textbook includes which of the following in the list of microbes?

I.	protozoa	II.	Viruses
III.	Viroids	IV.	Prions

1.	Only I, II and III	2.	Only I, III and IV
3.	Only II, III and IV	4.	I, II, III and IV

MICROBES IN HOUSEHOLD PRODUCTS

2 Lactic Acid Bacillus, while used for converting milk to curd, increases the nutritional value of curd by adding vitamin:

1.	A	2.	B_{12}
3.	C	4.	D

3 Lactic Acid Bacteria can check the growth of disease causing:

1.	*Bacillus clausii*	2.	*Helicobacter pylori*
3.	*Saccharomyces boulardii*	4.	*Clostridium butyricum*

4 The rising of dough is due to:

1. Multiplication of yeast
2. Production of CO_2
3. Emulsification
4. Hydrolysis of wheat flour starch into sugars

5 'Toddy', a traditional drink of some parts in southern India, is made by fermenting sap from:

1.	Soyabean	2.	Bamboo shoots
3.	Palms	4.	Sugarcane

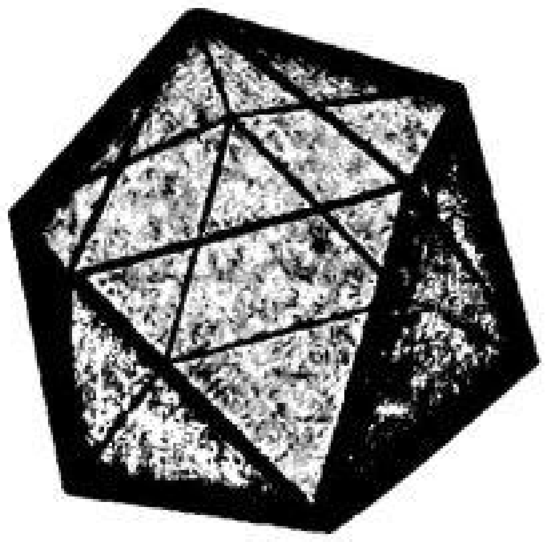
6 Large holes in Swiss cheese are the result of fermentation by:

1. *Streptococcus salivarius*
2. *Propionibacterium shermanii*
3. *Lactobacillus helveticus*
4. *Lactobacillus delbrueckii*

7 The 'Roquefort cheese' is ripened by:

1.	A fungus	2.	A bacterium
3.	An algae	4.	Lichens

8 The icosahedral symmetry shown below is exhibited by:



1. TMV
2. Adenovirus
3. HIV
4. Coronavirus

9 How many of the given statements are correct?

I:	The dough, which is used for making foods such as dosa and idli is fermented by yeast.
II:	The puffed-up appearance of dough is due to the production of CO_2 gas.
III:	The dough, which is used for making bread, is fermented using baker's yeast.
IV:	'Toddy', a traditional drink of some parts of southern India is made by fermenting sap from coconut.

1. 1
2. 2
3. 3
4. 4

10 During the production of curd from milk, lactic acid bacteria (LAB):

I:	produce acids that coagulate and partially digest the milk proteins.
II:	improves its nutritional quality by increasing vitamin B1.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

MICROBES IN INDUSTRIAL PRODUCTS

11 Which of the following alcoholic drinks are produced without distillation?

1.	Whiskey and Brandy	2.	Brandy and Rum
3.	Wine and Beer	4.	Wine and Brandy

12 With reference to human beings, antibiotics are actually:

1.	Anti life	2.	Pro-life
3.	Irrelevant to life	4.	Defining life

13 "I did not invent penicillin. Nature did that. I only discovered it by accident." Alexander Fleming describes the discovery as an 'accident' because he was actually trying to:

1.	isolate lysozyme
2.	develop better antisepsis procedures for contaminated wounds
3.	find a cure for the Spanish flu virus
4.	investigate the properties of staphylococci

14 Alexander Fleming discovered Penicillin and named it after:

1.	*Penicillium chrysogenum*	2.	*Penicillium roqueforti*
3.	*Penicillium notatum*	4.	*Penicillium camemberti*

15 Fleming first observed the antibiotic properties of the mould that makes penicillin. But the credit to develop it into a useful treatment goes to:

1.	Selman Waksman	2.	Florey and Chain
3.	Beadle and Tatum	4.	Zinder and Lederberg

16 Which of the following alcoholic drinks are expected to contain less than 15% alcohol content?

I:	Wine
II:	Beer
III:	Whisky
IV:	Rum

1.	Only I and II	2.	Only III and IV
3.	Only I and III	4.	Only II and IV

17 Which of the following human diseases cannot be treated by antibiotics?

1.	Plague	2.	Diphtheria
3.	Leprosy	4.	Mumps

18 Identify the incorrect statement:

1.	Antibiotics are chemical substances, which are produced by some microbes and can kill or retard the growth of other (disease-causing) microbes.
2.	Penicillin was the first antibiotic to be discovered, and it was a chance discovery.
3.	Alexander Fleming while working on Staphylococci bacteria, discovered Penicillin in the mould *Penicillium chrysogenum*.
4.	Penicillin's full potential as an effective antibiotic was established much later by Ernest Chain and Howard Florey.

19 Which microbe is used in in industry for preparing citric acid, gluconic acid and production of high-fructose corn syrup?

1. *Aspergillus niger*
2. *Trichoderma harzianum*
3. *Trichoderma polysporum*
4. *Tolypocladium inflatum*

20 Identify the incorrectly matched pair:

	Organic acid	Microbial source
1.	*Aspergillus niger*	Citric acid
2.	*Acetobacter aceti*	Acetic acid
3.	*Clostridium butylicum*	Chorismic acid
4.	*Lactobacillus*	Lactic acid

21 Fruit juices can be clarified with the use of:

1.	Lipases	2.	Papain
3.	Pectinase and protease	4.	Glucoamylase

22 Lipases are used in:

1. baby foods
2. detergent formulations
3. photographic films
4. meat tenderisation

23 What is streptokinase used for?

1.	It is used as an antibiotic to kill bacteria.
2.	It is used to curdle milk in the dairy industry.
3.	It is used as a clot buster for removing clots from the blood vessels.
4.	It is used in the production of biogas.

24 Consider the given two statements:

Statement I:	The bacterium, *Streptococcus,* is the source of an enzyme used in patients of myocardial infarction leading to a heart attack.
Statement II:	The enzyme is streptokinase, which enhances the action of anti-coagulant heparin.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

25 Cyclosporin A is used as a/an:

1.	immuno-suppressive agent in organ transplant patients
2.	clot buster to remove clots from the vessels in heart attack patients
3.	treatment option in advance for HIV infections
4.	agent that lowers blood cholesterol levels

26 Consider the given two statements:

Assertion (A):	Cyclosporin A is used as an immunosuppressive agent in organ-transplant patients.
Reason (R):	Cyclosporin A is a bioactive molecule produced by the fungus *Trichoderma polysporum.*

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	Both **(A)** and **(R)** are False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

27 Which bioactive substance can be used for the lowering of blood cholesterol levels in coronary artery disease patients?

1.	Statin	2.	Cyclosporin
3.	Streptokinase	4.	Papain

28 Consider the given two statements:

Assertion (A):	Statins produced by the yeast *Monascus purpureus* have been commercialised as blood-cholesterol lowering agents.
Reason (R):	Statins act by competitively inhibiting the enzyme responsible for the synthesis of cholesterol.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	Both **(A)** and **(R)** are False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**

29 The commercial production of Citric acid and Statins is possible with which of the following classes of microbes?

1.	Algae	2.	Fungi
3.	Bacteria	4.	Protists

30 Statins, used in pharmaceuticals as a blood cholesterol lowering agent, are commercially produced with the help of:

1. *Saccharomyces cerevisiae*
2. *Lactobacillus*
3. *Monascus purpureus*
4. *Streptococcus thermophilus*

MICROBES IN SEWAGE TREATMENT

31 Identify the incorrect statement regarding the primary treatment of sewage water in a sewage treatment plant:

1.	It basically involves the physical removal of particles – large and small.
2.	Floating debris is removed by sequential filtration.
3.	Grit [soli and small pebbles] are removed by sedimentation.
4.	All solids that settle form the activated sludge.

32 Which one of the following impurities is easiest to remove from wastewater?

1.	Bacteria	2.	Colloids
3.	Dissolved solids	4.	Suspended solids

33 The primary objective of the secondary treatment of sewage water is:

1.	the removal of coarse solids and other large materials often found in raw wastewater.
2.	the removal of settleable organic and inorganic solids by sedimentation, and the removal of materials that will float by skimming.
3.	production of biogas that can be used as an efficient fuel, especially in rural households.
4.	the removal of biodegradable dissolved and colloidal organic matter using aerobic biological treatment processes.

34 During which stage of the sewage treatment are the microbes used?

1.	Primary	2.	Secondary
3.	Tertiary	4.	Quaternary

35 Consider the given two statements:

I:	BOD is an indirect measure of the organic matter present in the water.
II:	The BOD test measures the rate of uptake of oxygen by microorganisms in a sample of water.

1.	Both **I** and **II** are correct and **II** explains **I**.
2.	Both **I** and **II** are correct but **II** does not explain **I**.
3.	Only **II** is correct.
4.	Both **I** and **II** are incorrect.

36 During the secondary or biological treatment of sewage water:

I.	The BOD of the wastewater gets reduced significantly.
II.	The activated sludge contains aerobic micro-organisms that can clump together.
III.	The entire activated sludge is pumped into anaerobic sludge digesters.

1. Only **I** is correct
2. Only **I** and **II** are correct
3. **I**, **II** and **III** are correct
4. **I**, **II** and **III** are incorrect

37 What would happen if oxygen availability to activated sludge flocs is reduced?

1.	It will slow down the rate of degradation of organic matter.
2.	The center of flocs will become anoxic, which would cause the death of bacteria and eventually breakage of flocs.
3.	Flocs would increase in size as anaerobic bacteria would grow around flocs.
4.	Protozoa would grow in large numbers.

38 In the anaerobic sludge digesters during sewage water treatment:

1.	The primary sludge is treated with aerobic microbes and activated sludge is created
2.	The primary sludge is treated with anaerobic microbes and activated sludge is created
3.	The activated sludge is digested by anaerobic microbes producing biogas during the process
4.	The activated sludge is digested by aerobic microbes producing biogas during the process

39 Methanogens:

I:	are commonly found in the anaerobic sludge during sewage treatment.
II:	are also present in the rumen (a part of stomach) of cattle.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

40 All the following statements regarding the primary treatment of sewage water in a STP are true except:

1.	Initially, floating debris is removed by sequential filtration.
2.	Then the grit (soil and small pebbles) are removed by sedimentation.
3.	All solids that settle form the primary sludge, and the supernatant forms the effluent.
4.	The effluent from the primary settling tank is discharged in rivers.

41 Regarding 'activated sludge' produced during secondary treatment of sewage water:

I:	A small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum.
II:	Major part of the sludge is pumped into large tanks called anaerobic sludge digesters.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

42 BOD (biochemical oxygen demand) and DO (dissolved oxygen) are measures of pollution levels in a given water sample. Higher the polluting potential of a water sample:

1.	Higher are the values of BOD and DO
2.	Lower are the values of BOD and DO
3.	Higher is the value of BOD and lower is the value of DO
4.	Lower is the value of BOD and higher is the value of DO

43 Consider the given two statements:

Assertion (A):	Secondary treatment of sewage water involves the use of aerobic bacteria.
Reason (R):	Aerobic bacteria break down organic matter into inorganic substances like CO_2 and H_2O.

Choose the correct option.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

44 What is true regarding the activated sludge generated during the secondary treatment of sewage water?

I:	It is made up of aerobic bacteria that sediment down
II:	A large part of the activated sludge is pumped back into the aeration tank to serve as the inoculum.
III:	A minor part of the sludge is pumped into large tanks called anaerobic sludge digesters.

1.	Only **I**	2.	Only **II** and **III**
3.	Only **I** and **III**	4.	**I, II** and **III**

45 The activated sludge process in sewage treatment is a type of:

1. Filtration process
2. Disinfection
3. Biological treatment
4. Sedimentation process

MICROBES IN PRODUCTION OF BIOGAS

46 Biogas is a mixture of:

1.	Methane, Carbon dioxide, and Hydrogen sulfide
2.	Methane, Carbon dioxide, and Ammonia
3.	Methane, Ammonia, and Hydrogen sulfide
4.	Ammonia, Carbon dioxide, and Hydrogen sulfide

47 Methanogenic bacteria are not found in:

1. rumen of cattle
2. gobar gas plant
3. bottom of water-logged paddy fields
4. activated sludge

48 The part of the complex stomach of ruminants that has methanogens present is the:

1.	Omassum	2.	Abomasum
3.	Rumen	4.	Reticulum

49 The residue left after methane production from cattle dung is:

1.	burnt	2.	buried in landfills
3.	used as manure	4.	used in civil construction

50 The technology of biogas production from cow dung was developed in India largely due to the efforts of:

1.	Gas Authority of India
2.	Oil and Natural Gas Commission
3.	Indian Agricultural Research Institute and Khadi & Village Industries Commission
4.	Indian Oil Corporation

51 Biogas

I:	is a renewable energy source produced by the anaerobic decomposition of organic matter.
II:	is a mixture of methane, carbon dioxide, and a small amount of hydrogen sulfide, and moisture.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

52 Which statement is true regarding biogas?

1.	Biogas is primarily composed of methane and is produced by the aerobic decomposition of organic matter.
2.	Biogas is produced through the anaerobic decomposition of organic matter by methanogens.
3.	Biogas production requires high temperatures to convert organic matter into methane.
4.	Biogas is composed mainly of carbon dioxide and nitrogen with traces of methane.

MICROBES AS BIOCONTROL AGENTS

53 The major problem with the use of chemicals to control plant diseases and pests is:

1. High cost
2. Ineffectivity against most pathogens
3. Difficulty in production
4. Non-specific nature

54 How many of the given statements regarding the use of the bacterium *Bacillus thuringiensis* as a biocontrol agent are true?

I.	The bacteria *Bacillus thuringiensis* is an example of a microbial biocontrol agent that can be introduced in order to control butterfly caterpillars.
II.	The bacteria are available in sachets as dried spores which are mixed with water and sprayed onto vulnerable plants such as brassicas and fruit trees, where these are eaten by the insect larvae.
III.	In the gut of the larvae, the toxin is released and the larvae get killed.
IV.	The bacterial disease will kill the caterpillars, but leave other insects unharmed.
V.	Because of the inadequate development of methods of genetic engineering, scientists have not been able to introduce B. thuringiensis toxin genes into plants.

1.	2	2.	3
3.	4	4.	5

55 Match each item in Column I [biocontrol agent] with one in Column II [pest controlled] and select the answer from the codes given:

	Column I		Column II
A.	Ladybird	P.	Mosquitoes
B.	Dragonflies	Q.	Aphids
C.	*Trichoderma*	R.	Fungus
D.	Baculoviruses	S.	Virus

Codes

	A	B	C	D
1.	P	Q	R	S
2.	Q	P	R	S
3.	P	Q	S	R
4.	Q	P	S	R

56 The free-living fungus *Trichoderma* can be used for:

1. killing insects
2. biological control of plant diseases
3. controlling butterfly caterpillars
4. producing antibiotics

57 Baculoviruses are excellent candidates for:

1. Species-specific, narrow-spectrum insecticidal applications
2. Species-specific, broad-spectrum insecticidal applications
3. Biocontrol of fungal diseases
4. Biocontrol of aphids and mosquitoes

58 Baculoviruses can play an important role in overall Integrated Pest Management in an ecologically sensitive area because:

1. They are effective against a large number of insects
2. Their use can help in the conservation of beneficial insects
3. They do not have any adverse effects on human health
4. They are cost-effective and can be easily applied as sprays by the farmer

59 Microbes can be used as biocontrol agents. The Ladybird, and Dragonflies are useful to get rid, respectively, of:

1. Jassids and Dipterans
2. Aphids and Mosquitoes
3. Corn borers and Bollworms
4. Roundworms and Fungal spores

60 An interesting example of fungus that is also used as a fungicide is:

1. *Trichoderma harzianum*
2. *Botrytis cinerea*
3. *Fusarium graminearum*
4. *Penicillium camemberti*

61 Consider he two statements:

Statement I:	The 'conventional' farming practices often use chemical methods which kill both useful and harmful life forms indiscriminately.
Statement II:	The organic farmer works to create a system where the insects that are sometimes called pests are not eradicated, but instead are kept at manageable levels.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

62 Consider the given two statements:

Assertion (A):	An important part of the biological farming approach is to become familiar with the various life forms that inhabit the field, predators as well as pests.
Reason (R):	This will help develop appropriate means of biocontrol.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2. **(A)** is True; **(R)** is False
3. **(A)** is False; **(R)** is False
4. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

63 Consider the given two statements:

Assertion (A):	The indiscriminate use of chemical pesticides is not desirable
Reason (R):	Chemical pesticides are non-specific, toxic and harmful.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

64 *Trichoderma harzianum* is a free-living fungus used for:

1.	killing insects
2.	biological control of fungal plant diseases
3.	controlling butterfly caterpillars
4.	producing antibiotics

MICROBES AS BIOFERTILIZER

65 Which one of the following is not a nitrogen-fixing organism?

1.	*Anabaena*	2.	*Nostoc*
3.	*Azotobacter*	4.	*Pseudomonas*

66 Mycorrhiza does not help the host plant in:

1.	Enhancing its phosphorus uptake capacity
2.	Increasing its tolerance to drought
3.	Enhancing its resistance to root pathogens
4.	Increasing its resistance to insects

67 What advantage does the mycobiont get in the mycorrhizal symbiotic relationship?

1.	Adequate uptake of water
2.	More availability of minerals like phosphorus
3.	Availability of carbohydrates for energy
4.	Resistance to diseases, drought, and salinity

68 Match each item in Column I [Diazotroph] with the feature in Column II and select the correct answer from the codes given below:

	Column I		**Column II**
A.	Cyanobacteria	a.	Actinorhizal symbiont
B.	*Frankia*	b.	Do not form nodules
C.	*Rhizobium*	c.	Free-living nitrogen fixer
D.	*Azotobacter*	d.	Legume symbiont

Codes

	A	B	C	D
1.	a	b	c	d
2.	b	a	c	d
3.	a	b	d	c
4.	b	a	d	c

69 The diazotroph that serves as an important biofertilizer in paddy fields is:

1.	*Rhizobium*	2.	*Frankia*
3.	*Azotobacter*	4.	*Anabaena*

70 Consider the two statements:

Assertion (A):	Use of chemical fertilisers in agriculture worldwide should be avoided.
Reason (R):	Chemical fertilisers, contrary to popular belief, are ineffective and do not add any nutrients to the soil.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False.
3.	**(A)** is False; **(R)** is True.
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

71 Cyanobacteria:

I:	serve as an important biofertilizer in paddy fields.
II:	add organic matter to the soil and increase its fertility.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

72 Name the genus of arbuscular mycorrhizal (AM) fungi, all species of which form symbiotic relationships (mycorrhizae) with plant roots:

1. *Cercospora*
2. *Glomus*
3. *Tetraploa*
4. *Rozella*

73 A mycorrhiza is a symbiotic association between a green plant and a fungus where:

I:	The plant makes organic molecules by photosynthesis and supplies them to the fungus in the form of sugars or lipids.
II:	The fungus supplies the plant with water and mineral nutrients, such as phosphorus, taken from the soil.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

74 Bacteria that fix gaseous nitrogen in the atmosphere into a more usable form, such as ammonia, while free-living in soil, include:

I:	*Azospirillum*
II:	*Azotobacter*
III:	*Rhizobia*
IV:	*Frankia*

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **I** and **III**
4. Only **III**

75 Mycorrhiza help the host plant in:

I:	Enhancing its phosphorus uptake capacity
II:	Increasing its tolerance to drought
III:	Enhancing its resistance to root pathogens

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

76 Nodules on the roots of leguminous plants are formed by the symbiotic association of:

1.	*Rhizobium*	2.	*Azospirillum*
3.	*Azotobacter*	4.	*Frankia*

77 In contrast to *Rhizobium* species, *Azotobacter* species are:

1.	lacking nitrogenase
2.	free-living, nitrogen-fixing bacteria
3.	obligate symbionts
4.	Gram-positive bacteria

78 Nitrogen fixation is carried out by:

1.	bacteria	2.	fungi
3.	protists	4.	algae

MICROBES IN HUMAN WELFARE - ANSWER KEY

1.	(4)	2.	(2)	3.	(2)	4.	(2)	5.	(3)	6.	(2)	7.	(1)	8.	(2)	9.	(2)	10.	(1)
11.	(3)	12.	(2)	13.	(4)	14.	(3)	15.	(2)	16.	(1)	17.	(4)	18.	(3)	19.	(1)	20.	(3)
21.	(3)	22.	(2)	23.	(3)	24.	(3)	25.	(1)	26.	(4)	27.	(1)	28.	(1)	29.	(2)	30.	(3)
31.	(4)	32.	(4)	33.	(4)	34.	(2)	35.	(1)	36.	(2)	37.	(2)	38.	(3)	39.	(3)	40.	(4)
41.	(3)	42.	(3)	43.	(1)	44.	(1)	45.	(3)	46.	(1)	47.	(4)	48.	(3)	49.	(3)	50.	(3)
51.	(3)	52.	(2)	53.	(4)	54.	(3)	55.	(2)	56.	(2)	57.	(1)	58.	(2)	59.	(2)	60.	(1)
61.	(1)	62.	(1)	63.	(1)	64.	(2)	65.	(4)	66.	(4)	67.	(3)	68.	(4)	69.	(4)	70.	(2)
71.	(3)	72.	(2)	73.	(3)	74.	(1)	75.	(4)	76.	(1)	77.	(2)	78.	(1)				

INTRODUCTION

1 The European Federation of Biotechnology [EFB] defines biotechnology as:

1.	The use of living cells and bacteria in industrial and scientific processes.
2.	The integration of natural sciences and organisms, cells, parts thereof, and molecular analogues for products and services.
3.	The use of biology to solve problems and make useful products.
4.	The use of biology to develop new products, methods and organisms intended to improve human health and society.

2 In a broad context, how many of the following could be included in 'biotechnology'?

I:	making curd, bread or wine
II:	use of genetically modified organisms to produce therapeutic proteins
III:	in vitro fertilisation leading to a 'test-tube' baby
IV:	synthesizing a gene and using it
V:	developing a DNA vaccine
VI:	correcting a defective gene

1.	3	2.	4
3.	5	4.	6

PRINCIPLES OF BIOTECHNOLOGY

3 Two core techniques that enabled birth of modern biotechnology are:

A:	Techniques to alter the chemistry of genetic material, to introduce these into host organisms and thus change the phenotype of the host organism.
B:	Maintenance of sterile ambience in chemical engineering process to enable growth of only the desired microbes/eukaryotic cell in large quantities for the manufacture of biotechnological products.

1.	A is called as Genetic Engineering and B is called as Biophysical engineering.
2.	A is called as Genomics and B is called as Bioprocess engineering.
3.	A is called as Genetic Engineering and B is called as Bioprocess engineering.
4.	A is called as Genomics and B is called as Biophysical engineering.

4 Bioprocessing engineering deals with:

1.	the search for plant and animal species from which medicinal drugs and other commercially valuable compounds can be obtained.
2.	developing methods and software tools for understanding biological data.
3.	production of active pharmaceutical substances in genetically modified organisms (GMOs).
4.	maintenance of sterile ambience in chemical engineering processes.

5 What limitation of traditional hybridization procedures used in plant and animal breeding can be overcome by recombinant DNA procedures?

I:	Inclusion and multiplication of undesirable genes
II:	Inability of inclusion of desirable traits from other species

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

6 A piece of DNA, somehow transferred into an alien organism, will be able to multiply itself in the progeny cells of organism if:

1.	It includes the centromere
2.	It becomes a part of chromosome
3.	It does not contain any intron sequences
4.	It is a single stranded polynucleotide

7 For the multiplication of any alien piece of DNA in an organism, it needs to be part of a chromosome that has a specific:

1.	Telomeric sequence	2.	Multiple cloning sites
3.	Ori	4.	Selectable marker

8 The work of which of the following scientists led to the establishment of the discipline of modern biotechnology?

1.	Banting and Best	2.	Bolivar and Rodriguez
3.	Hershey and Chase	4.	Cohen and Boyer

9 The construction of first rDNA emerged from the possibility of linking a gene encoding antibiotic resistance with a native plasmid of:

1.	*Salmonella typhimurium*	2.	*Escherechia coli*
3.	*Agrobacterium tumefaciens*	4.	*Haemophilus influenzae*

10 In recombinant DNA experiments, a vector:

1.	carries DNA into a new cell
2.	links together newly joined fragments of DN
3.	makes millions of copies of a specific segment of DNA
4.	separates fragments of DNA by their length and electrical charges

11 Consider the following statements:

I:	Asexual reproduction preserves genetic information while sexual reproduction permits variations.
II:	Traditional hybridization often leads to the inclusion and multiplication of undesirable genes along with the desired genes.
III:	rDNA technology allows us to isolate and introduce only one or a set of desirable genes without introducing undesirable genes in the target organism.

Which of the above statements are true?

1.	**I and II only**	2.	**I and III only**
3.	**II and III only**	4.	**I, II, and III**

12 The most important feature in a plasmid to serve as a vector in gene cloning experiment is:

1. Origin of replication (ori)
2. Presence of a selectable marker
3. Presence of sites for restriction endonuclease
4. Its size

TOOLS OF RECOMBINANT DNA TECHNOLOGY

13 The first type II restriction endonuclease discovered that could cut dsDNA at a specific site was:

1.	EcoRI	2.	SmaI
3.	*Hind II*	4.	*Hind III*

14 The term 'molecular scissors' is used for:

1.	restriction enzymes	2.	Taq polymerase
3.	reverse transcriptase	4.	DNA ligase

15 A nucleic acid that contains nucleotides from two different heterologous sources (species) is called as:

1.	B DNA	2.	rDNA
3.	mRNA	4.	tRNA

16 What can be the natural function of a restriction enzyme?

1.	To remove introns from hnRNA
2.	To cut dsRNA resulting in the formation of miRNA
3.	To cut foreign DNA
4.	To join exons after removal of introns from a transcript

17 The palindrome in DNA is a sequence of base pairs:

1.	that reads same on the two strands when orientation of reading is kept the same.
2.	that reads same on the two strands when orientation of reading is 5' to 3' on one end and 3' to 5' on the other.
3.	that are complementary on the two strands when orientation of reading is kept the same.
4.	that are complementary on the two strands when orientation of reading is 5' to 3' on one end and 3' to 5' on the other.

18 Identify the incorrect statement regarding restriction endonucleases:

1. They mostly cut dsDNA at specific base sequences.
2. They are produced by bacterial cells as a mechanism of self-defence.
3. They digest DNA by removing nucleotides from a free 3' end.
4. They often generate short single-stranded sequences at the ends of the resultant fragments.

19 Regarding the naming of restriction enzymes:

I: The enzyme names begin with an italicized three-letter acronym; the first letter of the acronym is the first letter of the genus of bacteria from which the enzyme was isolated, the next two letters are the two letters of the species.

II: These are followed by extra letters or numbers to indicate the serotype or strain, a space, then a Roman numeral to indicate the chronology of identification.

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

20 Which of the following statements does not hold true for restriction enzyme?

1. It recognises a palindromic nucleotide sequence
2. It is an endonuclease
3. It is isolated from viruses
4. It can produce the same kind of sticky ends in different DNA molecules

21 How does the bacterium protects its own DNA from the action of restriction endonucleases present in its cytoplasm?

1. its DNA lacks active sites for the restriction endonucleases
2. its DNA is protected within a nuclear envelope
3. it adds methyl groups to the active sites of restriction endonucleases on its DNA
4. the DNA gets heterochromatised to prevent the action of restriction enzymes

22 'Restriction' in Restriction enzyme refers to:

1. Cleaving of the phosphodiester bonds in DNA by the enzyme
2. Cutting of DNA at a specific position only
3. Prevention of the multiplication of bacteriophage by the host bacteria
4. All of the above

23 Restriction endonucleases present in bacterial cells provide an advantage to the cell because these enzymes:

1. can identify the mutated sequences on the chromosomal DNA and help in their repair
2. selectively bind to particular nucleotide sequences that may appear in viral DNA preventing its replication in the cell
3. can cut the plasmid DNA of the bacterial cell that allows them to recombine foreign DNA into their plasmid DNA
4. help the bacterium take up foreign DNA from their environment and combine it into their genome

24 Consider the two statements:

I: It is desirable to use restriction enzymes produce 'sticky ends' for cloning experiments in genetic engineering.

II: If the donor DNA and the vector DNA are cut by such same restriction endonuclease, ligation of the two is easy.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. Only **I** is correct
4. Both **I** and **II** are incorrect

25 DNA fragments digested by restriction endonucleases separate on agar gel electrophoresis according to their size because:

1. they are forced to move towards cathode under an electric field
2. agar gel provides a sieving effect
3. larger fragments will have more negative charge and will move farther in the electric field
4. chelation with ethidium bromide reduce the rate of transport of fragments

26 In agarose gel electrophoresis, the DNA fragments produced by restriction enzyme digestion:

1.	will move towards anode with smaller fragments moving farther than the larger segments
2.	will move towards anode with larger fragments moving farther than the smaller segments
3.	will move towards cathode with smaller fragments moving farther than the larger segments
4.	will move towards cathode with larger fragments moving farther than the smaller segments

27 Which of the given statements is correct in the context of visualizing DNA molecules separated by agarose gel electrophoresis?

1.	DNA can be seen in visible light
2.	DNA can be seen without staining in visible light
3.	Ethidium bromide stained DNA can be seen in visible light
4.	Ethidium bromide stained DNA can be seen under exposure to UV light

28 Elution is:

1.	separating the restricted DNA fragments on agarose gel
2.	staining the separated DNA fragments with ethidium bromide
3.	cutting out of the separated bands of DNA from the agarose gel and extracting them from the gel piece
4.	constructing rDNA by joining the purified DNA fragments to the cloning vector

29 When "sticky ends" are paired, they can be joined by:

1.	restriction enzymes	2.	polymerases
3.	methylase	4.	DNA ligase

30 If we are able to link an alien piece of DNA with bacteriophage or plasmid DNA, we can multiply its number:

1.	more than the number of copy number of bacteriophages in the cells and equal to the copy number of plasmid in the cell.
2.	equal to the number of copy number of bacteriophages in the cells and equal to the copy number of plasmid in the cell.
3.	equal to the number of copy number of bacteriophages in the cells and less than the copy number of plasmid in the cell.
4.	less than the number of copy number of bacteriophages in the cells and more than the copy number of plasmid in the cell.

31 What is true for the plasmids used as cloning vectors in recombinant procedures?

1.	Ori is responsible for controlling the copy number of linked DNA
2.	The bacteria lacking R plasmids are resistant to antibiotics
3.	The vector must have many sites for the same restriction enzyme
4.	They can carry largest inserts amongst the available cloning vectors

32 Which among the following is a cloning vector?

1.	EcoRI	2.	BamHI
3.	pUC18	4.	*Sal I*

33 A cloning vector must:

1.	be able to maintain a very high copy numbers of their genome in the host cells
2.	contain elements such as promoter and ribosome binding sites
3.	be engineered to carry a large number of recognition sequences for common restriction enzymes
4.	be able to replicate within host cell independent of the control of chromosomal DNA

34 The ability of plasmids and bacteriophage DNA to replicate within bacterial cells:

1.	depends on a particular or sequence of the main chromosomal DNA
2.	is possible due to promoter sequence present in the insert
3.	cannot occur without telomeric sequences
4.	is independent of the control of chromosomal DNA

35 What controls the copy number of linked DNA if plasmid is used as a vector in bacterial transformation?

1.	Ori	2.	rop
3.	Selectable markers	4.	Promoter in the insert

36 Some bacteria are resistant to antibiotics. This trait is normally due to:

1. lack of membrane bound organelles
2. presence of a cell wall
3. presence of an extra-chromosomal circular DNA
4. a unique feature called as inclusion bodies

37 pBR322 does not contain the site for:

1.	Pvu I	2.	*BamH I*
3.	Sma I	4.	*EcoR I*

38 A cloning vector has two antibiotic resistance genes: tetracycline and ampicillin. A foreign DNA was inserted into the tetracycline gene. Non-recombinant transformants would survive on the medium containing:

1.	ampicillin but not tetracycline
2.	tetracycline but not ampicillin
3.	both tetracycline and ampicillin
4.	neither tetracycline nor ampicillin

39 A donor DNA and plasmid vector DNA of E. coli are cut by EcoRI. The plasmid contains genes for resistance to ampicillin and tetracycline. The ECoRI recognition sequence lies within the gene for tetracycline resistance. Ligase is used, and the recombinant DNA is produced. The plasmids are transferred to *E.coli* with the help of electroporation. Samples of the bacterial colonies are then grown in four different media: nutrient medium plus ampicillin, nutrient medium plus tetracycline, nutrient medium plus ampicillin and tetracycline, and nutrient medium without antibiotics. Non-recombinant transformants will grow on:

1.	the nutrient medium plus ampicillin, but not on the medium containing tetracycline.
2.	only on the medium containing both antibiotics.
3.	on the medium containing tetracycline, but not on th medium containing ampicillin.
4.	on all four types of mediums.

40 Plasmid pUC18 carries lacZ gene that confers the host cells to convert white X-gal into blue indole. A gene is inserted within the lacZ gene of the plasmid. Bacterial cells transformed with this rDNA, if provided with X-gal in the medium, will produce:

1.	Blue colonies
2.	White colonies
3.	No colonies
4.	Orange colonies if seen through UV light

41 A plasmid contains two genes for resistance to separate antibiotics. One of the two is insertionally inactivated due to insertion of alien DNA.

I:	The gene that was not inactivated helps in selecting the transformants.
II:	The gene that was insertionally inactivated helps in selection of recombinants.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	**I, II** and **III** are correct

42 A reporter enzyme used in biotechnology includes all the following except:

1. Green Fluorescent Protein
2. Luciferase
3. Beta Galactosidase
4. Chloramphenicol acetyl transferase

43 *Agrobacterium tumefaciens* can be an effective vector for delivering genes of interest into the cells of:

1.	wheat	2.	soybean
3.	rice	4.	barley

44 The Ti plasmid, used in transformation of plant cells, is found in:

1.	*Agrobacterium tumefaciens*	2.	*Escherichia coli*
3.	*Bacillus thuringiensis*	4.	*Xanthomonas citri*

45 The number of correct statements regarding cloning vectors amongst the given statements is:

I.	Bacteriophages because of their high number per cell, have very high copy numbers of their genome within the bacterial cells.
II.	If one wants to recover many copies of the target DNA, it should be cloned in a vector whose origin supports high copy number.
III.	A selectable marker helps in identifying and eliminating non-transformants and selectively permits the growth of the transformants.
IV.	Ti plasmid of *Agrobacterium tumefaciens* has now been modified into a cloning vector which is no more pathogenic to the plants but is still able to use mechanisms to deliver genes of our interest into a variety of plants.
V.	Retroviruses in animals have the ability to transform normal cells into cancerous cells and hence can never be used as a cloning vector in rDNA procedures.

1.	2	2.	3
3.	4	4.	5

46 *Agrobacterium tumifaciens*:

I:	is a pathogen of several monocot plants
II:	is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor and direct these tumor cells to produce the chemicals required by the pathogen.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

47 Consider the given two statements:

Statement I:	*Agrobacterium tumefaciens* cannot be used to genetically modify rice and wheat.
Statement II:	*Agrobacterium tumefaciens* cannot infect monocots.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

48 How does *Agrobacterium tumefaciens* transform plant cells?

1.	By altering the pH of the plant cell environment to promote bacterial growth.
2.	By destroying the plant cell wall allowing bacterial cells to fuse with plant cells.
3.	By transferring bacterial proteins into plant cells without transferring DNA.
4.	By injecting its plasmid DNA into plant cells, which integrates into the plant genome.

49 Which of the following can be used to induce competence for getting a bacterial cell transformed during rDNA procedures?

1.	A divalent cation	2.	Ethidium bromide
3.	Polyethylene glycol	4.	Anionic proteins

50 What temperature is used to give heat shock when competence is induced in a bacterial host cell enabling it to take up rDNA?

1.	27°C	2.	42°C
3.	72°C	4.	98°C

51 Consider the given two statements:

Assertion (A):	DNA normally does not pass through the cell membrane.
Reason (R):	DNA is a hydrophobic molecule

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

52 Competence can be induced in bacteria by the use of which of the following divalent cations?

1.	Zinc	2.	Magnesium
3.	Iron	4.	Calcium

53 A method used only for transforming animal cells is:

1.	Biolistics	2.	Microinjection
3.	Use of virus	4.	Agrobacterium mediation

54 In microinjection, the rDNA :

1.	coats the micropellets and is used in biolistics to transform plant cells
2.	is directly injected into the cytoplasm of a plant or an animal cell
3.	is delivered in the vicinity of the plasma membrane of the cell (to be transformed)
4.	is directly injected into the nucleus of an animal cell

55 Regarding the possible ways to introduce alien DNA into host cells:

I.	In a method known as micro-injection, recombinant DNA is directly injected into the nucleus of an animal cell.
II.	In another method, suitable for plants, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as biolistics or gene gun.
III.	A method uses 'disarmed pathogen' vectors, which when allowed to infect the cell, transfer the recombinant DNA into the host.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. **I, II** and **III** are correct

56 Which of the following is normally not used as a method of introduction of foreign DNA into an animal cell?

1.	Microinjection	2.	Liposomes
3.	Biolistics	4.	Transfection

57 Biolistics is the term used for:

1.	a method especially suitable for transforming plant cells
2.	a method to induce competence in plant cells
3.	a method to convert plant cells into protoplasts
4.	a method to generate organs in undifferentiated callus

PROCESS OF RECOMBINANT DNA TECHNOLOGY

58 Isolation of DNA in pure form from an animal cell involves:

1.	Adding alcohol to precipitate the DNA.
2.	Heating the cell to denature DNA.
3.	Using enzymes to cut the DNA into smaller fragments.
4.	Exposing the cell to ultraviolet light.

59 To isolate DNA in pure form from a plant cell, the plant cell must first be treated with:

1. Ice
2. Calcium chloride
3. Cellulase
4. Lysozyme

60 Which enzyme must not be used when isolating DNA in pure form from a bacterial cell?

1. Lysozyme
2. Ribonuclease
3. Deoxyribonuclease
4. Protease

61 Which enzyme must not be used when isolating DNA in pure form from a cellular pool of biomolecules?

1.	DNase	2.	RNase
3.	Protease	4.	Lipase

62 If you want to isolate DNA in pure form from a fungal cell, the first enzyme required normally would be:

1.	Restriction endonuclease	2.	DNA ligase
3.	DNA polymerase	4.	Chitinase

63 Consider the two statements:

I:	Agar Gel electrophoresis is useful in analysis of DNA.
II:	DNA is generally positively charged due to its nitrogenous bases so an electrical field forces it to move toward a negative pole.

1.	Both I and II are correct and II explains I
2.	Both I and II are correct but II does not explain I
3.	I is correct but II is incorrect
4.	Both I and II are incorrect

64 A plasmid DNA has one site for a restriction endonuclease. When cut and separated on agarose gel electrophoresis:

1.	only one fragment is seen
2.	two fragments are seen
3.	the cut plasmid DNA will not move and so no fragment is seen
4.	a large number of small sized fragments are seen

65 Agarose is:

1.	a polysaccharide obtained from certain red alga.
2.	a polysaccharide obtained from certain brown alga.
3.	a polypeptide obtained from certain red alga.
4.	a polypeptide obtained from certain brown alga.

66 What is the purpose of using agarose gel electrophoresis in biotechnology processes?

1.	To replicate DNA fragments rapidly.
2.	To cut DNA into smaller fragments using restriction enzymes.
3.	To separate DNA fragments based on their size.
4.	To join fragments of DNA from different sources.

67 Match the enzyme with its function in genetic engineering.

	Column I		Column II
A.	DNA polymerase	1.	Joining DNA fragments
B.	Restriction endonuclease	2.	Synthesizes new strands of DNA
C.	DNA ligase	3.	Cuts DNA at specific sequences
D.	Reverse transcriptase	4.	Synthesizes DNA from RNA template

1. A-2, B-3, C-1, D-4
2. A-2, B-1, C-3, D-4
3. A-3, B-1, C-2, D-4
4. A-4, B-3, C-1, D-2

68 The underlying basis of the Polymerase Chain Reaction is:

1.	DNA synthesis and hence amplification can occur in a template independent manner.
2.	DNA, being thermostable, can be amplified during the thermal cycle in PCR.
3.	DNA polymerase I can synthesize large amounts of DNA.
4.	PCR allows the direct amplification of DNA even if it is present in minute quantities.

69 The steps included in a cycle of Polymerase Chain Reaction are:

1.	initiation, elongation, and termination
2.	transfection, transformation, and transduction
3.	denaturation, annealing, and extension
4.	restriction, electrophoresis, and elution

70 Which of the following primers would allow copying of the single-stranded DNA sequence 5' ATGCCTAGGTC?

1.	5' TACGG	2.	5' CTGGA
3.	5' GACCT	4.	5' GGCAT

71 The enzyme used in the polymerase chain reaction is a:

1. DNA dependent RNA polymerase
2. RNA dependent DNA polymerase
3. DNA dependent DNA polymerase
4. RNA dependent RNA polymerase

72 Which of the following contributed in popularising the PCR (polymerase chain reactions) technique?

1.	Easy availability of DNA template
2.	Availability of synthetic primers
3.	Availability of cheap deoxyribonucleotides
4.	Availability of 'Thermostable' DNA polymerase

73 Taq polymerase is used in the polymerase chain reaction because:

1.	It replicates DNA faster than other enzymes
2.	It is the only enzyme that can replicate DNA invitro
3.	It does not require an RNA primer to function
4.	It is thermostable

74

Assertion (A):	Thermostable DNA dependent DNA polymerase is used in Polymerase Chain Reaction
Reason (R):	Such enzymes do not require primers and can initiate DNA synthesis

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

75 The importance of polymerase chain reaction (PCR) in biotechnology lies in its ability to:

1.	Quickly synthesize small DNA fragments for gene therapy.
2.	Amplify large quantities of DNA from a small sample.
3.	Cut specific DNA fragments for cloning.
4.	Directly insert genes into living cells.

76 30 cycles of a polymerase chain reaction can increase the number of a DNA fragments to about:

1. 1,000,000
2. 10,000,000
3. 50,000,000
4. 1,000,000,000

77 The requirement of primers in a polymerase chain reaction (PCR) is because they:

1.	Provide the starting point for DNA synthesis.
2.	Help in cutting the DNA into smaller fragments.
3.	Join the DNA fragments after amplification.
4.	Act as selectable markers.

78 *Pfu* DNA polymerase is used in:

1.	amplifying DNA in the polymerase chain reaction (PCR).
2.	creation of blunt ends in digested DNA fragments.
3.	artificial synthesis of DNA in a template independent manner.
4.	proof reading of newly synthesized DNA strands.

79 During which stage of the PCR is the Taq polymerase used?

1. Denaturation
2. Annealing of primer
3. Extension of primer
4. During all of the above three stages

80 Which step of PCR reaction is carried out at a high temperature of about 98 degree celsius?

1. Denaturation of template DNA
2. Annealing of primers to template DNA
3. Extension of primer end on the template DNA
4. Both II and III

81 Who was awarded Nobel prize for the invention of PCR?

1. Thomas Cech
2. Fred Sanger
3. Kary Mullis
4. Millstein and Kohler

82 A plasmid has two genes providing resistance to antibiotics A and B respectively. A foreign DNA has been inserted within the gene for resistance to antibiotic A:

I.	Non-Transformants will not survive in a medium containing antibiotic A and in a medium containing antibiotic B.
II.	Recombinant transformants will survive in a medium containing antibiotic B but not in a medium containing antibiotic A.
III.	Non-recombinant transformants will survive in a medium containing antibiotic A and in a medium containing antibiotic B.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

83 Consider the given two statements:

Assertion (A):	In most recombinant technologies, there is a need for the recombinant DNA to be expressed.
Reason (R):	In most recombinant technologies, the ultimate aim is to produce a desirable protein.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

84 If any protein-encoding gene is expressed in a heterologous host, the protein formed is called:

1.	Recombinant protein	2.	Native protein
3.	Pro-protein	4.	Exotic protein

85 Which of the following should be chosen for the best yield if one were to produce a recombinant protein in large amounts?

1.	Laboratory flask of the largest capacity
2.	A stirred-tank bioreactor without in-lets and out-lets
3.	A continuous culture system
4.	Any of the above

86 Consider the given two statements:

Assertion(A):	Almost always, there is a need for the recombinant DNA to be expressed in a heterologous host.
Reason (R):	If any protein encoding gene is expressed in a heterologous host, it is called a recombinant protein.

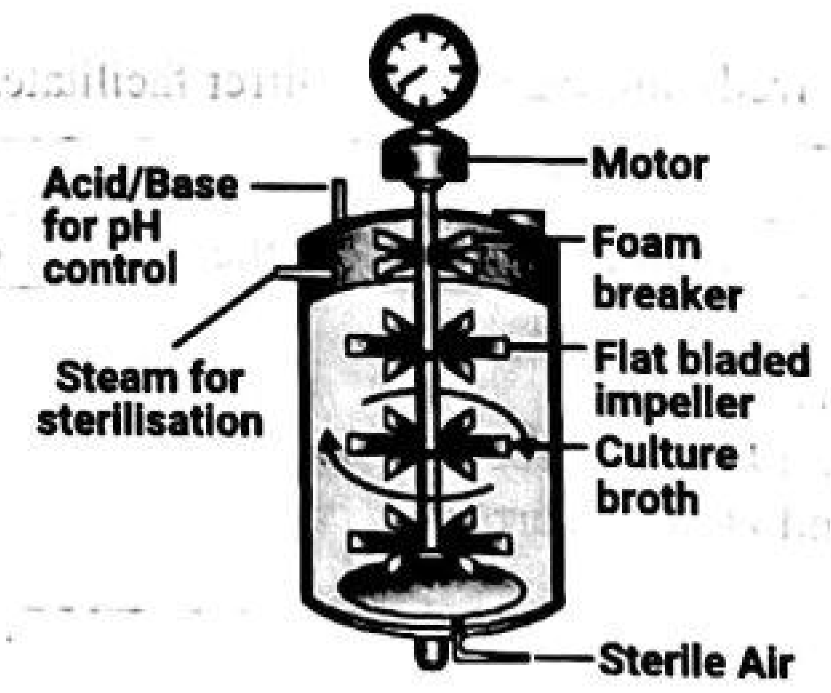
1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

87 Consider the two statements:

Assertion (A):	A continuous culture is likely to produce more biomass in industrial production of recombinant products
Reason (R):	In continuous culture, the microbes are continuously kept in their log phase of growth.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

88 The bioreactor shown in the diagram is:



1.	Sparged stirred tank type	2.	Airlift type
3.	Simple stirred tank type	4.	Fluidized bed type

89 Consider the given two statements:

Assertion (A):	The most commonly used bioreactors for biosynthesis are of stirring type.
Reason (R):	A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True; **(R)** is False
3.	**(A)** is False; **(R)** is False
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

90 How many of the given statements are correct?

I:	Bioreactors can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, etc., using microbial plant, animal or human cells.
II:	A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, pH, substrate, salts, vitamins, oxygen).
III:	The most commonly used bioreactors are of stirring type.

1. 0
2. 1
3. 2
4. 3

91 In a stirred-tank reactor, the stirrer facilitates:

I:	even mixing of nutrients in the medium
II:	oxygen availability throughout the bioreactor

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

92 The downstream processing stage of rDNA does not involve:

1.	Biosynthesis	2.	Separation
3.	Purification	4.	Preservation

93 What is true regarding Downstream Processing?

I:	This stage is after the biosynthetic stage.
II:	The processes include separation and purification.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

94 In the processes of Recombinant DNA Technology, downstream processing:

I:	occurs after the completion of the biosynthetic stage.
II:	involves processes that make products ready for marketing as a finished product.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

95 Consider the given two statements:

Assertion (A):	Downstream processing is vital in biotechnology for the purification of products.
Reason (R):	It ensures that the products are of high purity and quality, suitable for industrial and clinical use.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

BIOTECHNOLOGY AND ITS APPLICATIONS

INTRODUCTION

1 The critical research areas of biotechnology include all the following except:

1. Providing the best catalyst in the form of improved organism usually a microbe or pure enzyme.
2. Creating optimal conditions through engineering for a catalyst to act.
3. Downstream processing technologies to purify the protein/organic compound.
4. Development of new genetically modified microbes that can be used as bio-weapons.

BIOTECHNOLOGICAL APPLICATIONS IN AGRICULTURE

2 Increased yield of crop during the green revolution was due to:

I. Use of improved crop varieties
II. Use of better management practices
III. Use of agrochemicals [fertilisers and pesticides]

1.	Only **I**	2.	Only **I** and **III**
3.	Only **I** and **II**	4.	**I, II** and **III**

3 Any part of a plant taken out and grown in a test tube under sterile conditions in special nutrient media for generating new plants is called:

1.	Implant	2.	Explant
3.	Supplant	4.	Plantlet

4 The term 'totipotency' refers to the capacity of a:

1. cell to generate the whole plant
2. bud to generate the whole plant
3. seed to germinate
4. cell to enlarge in size

5 The most important advantage of micropropagation is:

1. production of virus free plants
2. rapid production of a large number of genetically identical superior plants
3. creation of somaclonal variations for effective germplasm collection
4. production of transgenic plants

6 Micro-propagation is:

1. propagation of microbes in vitro
2. propagation of plants in vitro
3. propagation of cells in vitro
4. growing plants on a smaller scale

7 The plantlets produced during plant tissue culture are called somaclones because:

1. They can be produced in a very short span of time
2. They are the result of the somatic hybridization of two cells
3. The gametes develop parthenogenetically to produce genetically identical plantlets
4. They are genetically identical to the original plant from which they were grown

8 Somaclonal variations are:

1. seen in plants that have been produced by plant tissue culture.
2. due to environmental factors and have no evolutionary advantage.
3. induced by mutations and are inherited.
4. not useful in plant breeding programs.

9 A crop gets infected with a certain virus and the farmers of the area suffer immense financial loss. You have been asked to help the farmers and you decide to improve the crop by raising virus-free plants through plant tissue culture. The explant you will choose must be:

1.	Meristem	2.	Anther
3.	Embryo	4.	Internode

10 The first step to achieve somatic hybridization in plants will be:

1.	growing individual cells into callus
2.	fusion of two cells in the presence of polyethylene glycol
3.	converting plant cells into protoplast by cellulase
4.	growing plant cells in cytokinin

11 Protoplast is:

1.	another name for protoplasm	2.	an animal cell
3.	a plant cell without a cell wall	4.	a plant cell

12 Given below are a few statements regarding somatic hybridization. Choose the correct statements:

(i)	protoplasts of different cells of the same plant are fused.
(ii)	protoplasts from cells of different species can be fused.
(iii)	treatment of cells with cellulase and pectinase is mandatory.
(iv)	the hybrid protoplast contains characters of only one parental protoplast.

1.	**(i) and (iii)**	2.	**(i) and (ii)**
3.	**(i) and (iv)**	4.	**(ii) and (iii)**

13 All the following are possible today with the use of GM crops except:

1.	More tolerance to abiotic stresses
2.	Alternative resources to industries
3.	Increased efficiency of mineral usage by plants
4.	Fixation of atmospheric nitrogen

14 GM crops have been modified with various traits. Golden rice has been developed by the International Rice Research Institute for:

1.	Improved shelf life	2.	Disease resistance
3.	Herbicide resistance	4.	Improved nutritional value

15 Consider the two statements:

I:	Use of genetically modified crops can be a possible solution for minimizing the use of chemicals and fertilizers that are detrimental for the environment.
II:	Genetically modified crops do not require any fertilizers.

1.	Both **I** and **II** are correct and **II** explains **I**.
2.	Both **I** and **II** are correct but **II** does not explain **I**.
3.	**I** is correct but **II** is incorrect.
4.	Both **I** and **II** are incorrect.

16 Bt cotton is not:

1.	A GM plant
2.	Insect resistant
3.	A bacterial gene expressing system
4.	Resistant to all pesticides

17 *Bacillus thuringiensis* (Bt) strains have been used to design novel:

1.	Biofertilizers	2.	Biometallurgic techniques
3.	Biomineralization processes	4.	Bioinsecticidal plants

18 Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as:

I:	lepidopterans including tobacco budworm and armyworm
II:	coleopterans including beetles
III:	dipterans including flies and mosquitoes

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

19 *Bacillus thuringiensis* (Bt) is significant in biotechnology because:

1.	It produces Bt toxin, which is effective against insect pests when introduced into crops.
2.	It is used to enhance the flavor and nutritional content of food crops.
3.	It fixes nitrogen in soil, promoting plant growth.
4.	It increases the rate of photosynthesis in plants.

20 Consider the given two statements:

I:	Spores and crystalline insecticidal proteins produced by B. thuringiensis are now used as insecticides in organic farming.
II:	Because of their specificity, these pesticides are regarded as environmentally friendly, with little or no effect on humans, wildlife, pollinators, and most other beneficial insects.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. **I** is incorrect but **II** is correct

21 The trigger for activation of toxin of *Bacillus thuringiensis* is:

1.	Acidic pH of stomach
2.	High temperature
3.	Alkaline pH of gut
4.	Mechanical action in the insect gut

22 Identify the incorrect statement:

1.	*B. thuringiensis* forms protein crystals during a particular phase of its growth.
2.	The protein crystals contain a toxic insecticidal protein.
3.	Once an insect ingests the inactive toxin, it is converted into an active form of toxin due to the acidic pH of the gut.
4.	The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually cause the death of the insect.

23 Corn borer can be controlled by the proteins encoded by *Bacillus thuringiensis* gene:

1.	*cryIAb*	2.	*cryIAc*
3.	*cryIIAb*	4.	*cryIIIAc*

24 Proteins encoded by *cryIAc* and *cryIIAb* genes in Bacillus thuringiensis help in control of:

1. corn borer
2. cotton bollworms
3. mosquitoes
4. beetles

25 Consider the given two statements:

Statement I:	Bt cotton contains genes from the bacterium *Bacillus thuringiensis*, which produce Cry proteins toxic to specific insect pests.
Statement II:	The Cry proteins formed in Bt cotton dissolve the gut lining of insects, leading to their death when they feed on the cotton leaves.

1. **Statement I** is True, **Statement II** is False.
2. **Statement I** is False, **Statement II** is True.
3. Both **Statement I** and **Statement II** are True.
4. Both **Statement I** and **Statement II** are False.

26 A transgenic tobacco plant was created to make it resistant to:

1.	a nematode, *Meloidogyne incognita*.
2.	a nematode, *Caenorhabditis elegans*.
3.	a trematode, *Clonorchis sinensis*.
4.	a cestode, *Taenia sloium*.

27 RNAi, as a mechanism of cellular defense, takes place in:

1.	All bacteria	2.	All unicellular organisms
3.	All plants only	4.	All eukaryotic organisms

28 Nematode [*Meloidogyne incognita*] specific genes were transferred to tobacco plant using:

1.	Retroviral vectors	2.	Gene gun
3.	*Agrobacterium* mediation	4.	Micro-injection

29 RNA interference involves silencing a specific mRNA by:

1.	interfering with its post transcriptional modification
2.	not allowing the transport of mRNA from nucleus to cytoplasm
3.	a dsRNA that binds to it and prevents its translation
4.	post translational degradation of the protein

30 Identify the incorrect statement regarding the use of RNAi for creating transgenic tobacco plants resistant to *Meloidogyne* incognita:

1.	*Agrobacterium tumefaciens* was used to transform the plant cells
2.	Double-stranded RNA was introduced into the plant cells
3.	Double-stranded RNA was formed in the plant cells that initiated RNAi
4.	A specific mRNA of the nematode was silenced with the help of dsRNA

31 The source of complementary RNA for RNAi in a eukaryotic cell could be:

I:	An infection by viruses having RNA genomes
II:	Mobile genetic elements that replicate via an RNA intermediate
III:	Integration of phage DNA into the main chromosomal DNA of a eukaryotic cell

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

32 A biological process in which RNA molecules inhibit gene expression or translation, by neutralizing targeted mRNA molecules is known as:

1.	Bioprospecting	2.	Molecular pharming
3.	RNA interference	4.	Insertional mutagenesis

33 RNA interference:

I:	involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing).
II:	has been used to create transgenic tobacco plants resistant to nematode Meloidogyne incognita

1.	Only **I** is correct	2.	Only **II** is correct
3.	Both **I** and **II** are correct	4.	Both **I** and **II** are incorrect

BIOTECHNOLOGICAL APPLICATIONS IN MEDICINE

34 The first drug produced using recombinant DNA technology is used to treat:

1.	haemophilia	2.	dwarfism
3.	immunodeficiency	4.	diabetes

35 The two polypeptide chains of insulin protein are linked together by:

1.	disulfide bonds	2.	hydrogen bonds
3.	covalent bonds	4.	ionic bonds

36 C-peptide of human insulin is:

1.	A part of mature insulin molecule
2.	Responsible for formation of disulphide bridges
3.	Removed during maturation of pro-insulin to insulin
4.	Responsible for its biological activity

37 The main challenge for production of insulin using rDNA techniques was:

1.	to find a suitable host cell that can perform RNA splicing
2.	isolation of a copy of gene from the human DNA
3.	getting insulin assembled into a mature form
4.	downstream processing

38 How many of the given statements regarding insulin are correct?

I:	All diabetics require insulin from the very beginning.
II:	Insulin can be given orally to diabetics.
III.	Insulin extracted from pancreas of slaughtered cattle and pigs caused some patients to develop allergy.
IV.	Recombinant insulin was first prepared by Indian pharmaceutical giant Ranbaxy.
V.	The two polypeptide chains in the final structure of Insulin are joined by disulfide bonds.
VI.	DNA sequences corresponding to A and B chains of human insulin were introduced in plasmids of *E.coli* to produce insulin chains for preparing recombinant insulin.

1.	2	2.	3
3.	4	4.	5

39 To produce human recombinant insulin, Eli Lily:

1.	prepared two DNA sequences corresponding to A and B chains of human insulin and introduced them in plasmids of E. coli to produce insulin chains.
2.	prepared two DNA sequences corresponding to A and C chains of human insulin and introduced them in plasmids of Yeast to produce insulin chains.
3.	used reverse transcription of the hnRNA transcript of the insulin gene to make complementary DNA.
4.	used fragments created by restriction enzyme digestion to isolate and used the gene for insulin from pancreatic cells.

40 Insulin earlier extracted from pancreas of slaughtered cattle and pigs:

I:	was not effective at all in bringing blood glucose levels down towards normal range in diabetics.
II:	caused some patients to develop allergy or other types of reactions to the foreign protein.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

41 The first recombinant therapeutic product approved for human use was:

1. Flavr Savr
2. EPO
3. Human Growth Hormone
4. Human Insulin

42 The plasmid of which of the following bacteria was used to produce human insulin?

1. *Salmonella typhimurium*
2. *Klebsiella pneumoniae*
3. *Escherichia coli*
4. *Agrobacterium tumefaciens*

43 What is an advantage of recombinant insulin over insulin obtained from animal sources?

1.	Recombinant insulin is cheaper to produce and more ethical.
2.	It is identical to human insulin, reducing allergic reactions and increasing efficacy.
3.	It can be orally ingested instead of injected.
4.	It has a longer shelf-life.

44 Human insulin produced through recombinant DNA technology:

1.	Has a higher risk of causing allergies compared to pig insulin.
2.	Is exactly the same as insulin produced in the human pancreas.
3.	Is produced by inserting the human insulin gene into bacteria.
4.	Requires human cells for production.

45 Which of these is an accurate description of gene therapy?

1.	A form of site directed mutagenesis.
2.	Introduction of cloned genes into living cells to cure disease.
3.	Cloning of a disease gene in order to understand the disease.
4.	All of these.

46 Identify the correct statements:

I:	ADA deficiency is caused due to the deletion of the gene for adenosine deaminase.
II:	Bone marrow transplant and enzyme replacement therapy are completely curative.
III.	Lymphocytes transformed with cADA gene are permanent cure for the condition.

1.	Only I and II	2.	Only I
3.	Only II and III	4.	I, II and III

47 The first clinical gene therapy trial was given in 1990 to a 4 year girl with:

1.	Alpha – 1 antitrypsin deficiency
2.	Cystic fibrosis
3.	Adenosine deaminase deficiency
4.	Chronic myeloid leukemia

48 Gene therapy for ADA deficiency has been tried with the help of which of the following vectors?

1.	Microinjection	2.	Liposome
3.	A bacterium	4.	A retrovirus

49 A possible permanent cure for SCID can be:

1.	Enzyme replacement therapy, in which functional ADA is given to the patient by injections.
2.	Bone marrow transplantation.
3.	A functional ADA cDNA (using a retroviral vector) introduced into lymphocytes.
4.	Gene isolated from marrow cells producing ADA is introduced into cells at early embryonic stages.

50 ADA is an enzyme which is deficient in a genetic disorder SCID. What is the full form of ADA?

1.	Adenosine deoxyaminase	2.	Adenosine deaminase
3.	Aspartate deaminase	4.	Arginine deaminase

51 Consider the two statements:

I:	Retroviruses are useful as vectors in gene therapy.
II:	They can produce useful gene products in significantly greater quantities than a single human cell can.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. Only **I** is correct.
4. Both **I** and **II** are incorrect.

52 The site of production of ADA in the body is:

1.	Erythrocytes	2.	Lymphocytes
3.	Blood plasma	4.	Osteocytes

53

Assertion(A):	Delivery of ADA cDNA into lymphocytes is not a permanent cure for ADA deficiency
Reason(R)	Lymphocytes do not express ADA gene.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of the **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of the **(A)**
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

54 Consider the given two statements:

Statement I:	In some children, ADA deficiency can be cured by bone marrow transplantation; in others, it can be treated by enzyme replacement therapy.
Statement II:	Both these approaches are completely curative.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

55 Consider the given two statements:

Assertion (A):	Enzyme Replacement Therapy in ADA deficiency is not completely curative.
Reason (R):	Enzyme Replacement Therapy can induce severe toxic reactions in the host.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

56 ADA's primary function in humans is:

1.	to develop and maintain the immune system.
2.	to stimulate the phagocytes.
3.	to regulate the complement system.
4.	to help differentiation of monocytes into macrophages

57 Adenosine deaminase deficiency is a disorder caused due to:

1.	an inversion of the chromosomal segment containing the gene for adenosine deaminase
2.	a translocation event involving the segment of the chromosome containing the gene for adenosine deaminase
3.	a duplication of the gene for adenosine deaminase
4.	deletion of the gene for adenosine deaminase

58 The biggest advantage of using Recombinant DNA technology, PCR and ELISA, over conventional diagnostic techniques like serum and urine analysis will be:

1. cost effectiveness
2. early detection
3. absence of adverse effects
4. universal availability

59 Consider the two statements:

Assertion (A):	PCR has revolutionized the molecular diagnosis and allows early diagnosis in many cases.
Reason (R):	PCR can detect very low amounts of DNA in a sample.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

60 ELISA is based on the principle of:

1.	Complementary hybridization of nucleic acids
2.	Antigen-antibody interaction
3.	Clonal selection
4.	Southern blot

61 With the help of ELISA, infection by pathogen can be detected by the presence in a sample of:

I. antigens of the pathogen

II. antibodies synthesized against the pathogen

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

62 A probe which is a molecule used to locate homologous sequences in a mixture of DNA or RNA molecules could be:

1.	A ssRNA	2.	A ssDNA
3.	Either RNA or DNA	4.	Can be ssDNA but not ssRNA

TRANSGENIC ANIMALS

63 Transgenic animals are the animals that:

1.	have had their DNA manipulated to possess and express an extra [foreign] gene.
2.	are genetically modified with the use of foreign genes from a sexually compatible donor organism.
3.	are produced by interspecific hybridisation.
4.	are produced by inbreeding.

64 Over 95 % of all transgenic animals are:

1.	Mice	2.	Pigs
3.	Sheep	4.	Rabbits

65 Transgenic animals used to test the safety of polio vaccine are:

1.	Mice	2.	Monkeys
3.	Rabbits	4.	Pigs

66 The transgenic cow, Rosie, produced milk that:

1.	Contained human beta lactalbumin
2.	contained interferons to treat viral infections
3.	contained Alpha – 1 antitrypsin
4.	Is protein enriched

67 Alpha-1-antitrypsin was produced in a transgenic sheep, Tracy. This enzyme is used in the treatment of:

1.	Emphysema	2.	Rheumatoid arthritis
3.	Ovarian cancer	4.	Pancreatitis

68 At present transgenic animals cannot be used for:

1.	Harvesting biological products
2.	Testing vaccine safety
3.	Study of human diseases
4.	Xenotransplantation

69 Transgenic mice are being used to test the safety of polio vaccine. They could replace the use of:

1.	Monkeys	2.	Rabbits
3.	Fowl	4.	Frogs

70

Assertion (A):	Transgenic animals can be specifically designed to allow the study of how genes are regulated, and how they affect the normal functions of the body and its development, e.g., study of complex factors involved in growth such as insulin-like growth factor.
Reason (R):	By introducing genes from other species that alter the formation of this factor and studying the biological effects that result, information is obtained about the biological role of the factor in the body.

1.	Both **(A)** and **(R)** are True and the **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but the **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

71 If successful and found to be reliable, what GM animals could replace the use of monkeys to test the safety of batches of the oral polio vaccine?

1. Rats
2. Rabbits
3. Mice
4. Pigs

72 Consider the given two statements:

Assertion (A):	The milk produced by the first transgenic cow, Rosie, was nutritionally a more balanced product for human babies than natural cow-milk.
Reason (R):	The first transgenic cow, Rosie, produced human lactose-enriched milk.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

73 An animal that has had foreign genes (genes from another species) intentionally introduced into its genome using genetic engineering techniques will be called as:

1.	Transgenic	2.	Recombinant
3.	Heterologous	4.	Panmict

74 Which statement about transgenic animals used in testing vaccine safety is correct?

1.	Transgenic animals are primarily used because they reproduce more quickly.
2.	They are genetically modified to have immune systems that mimic human responses.
3.	Transgenic animals are less expensive to maintain compared to non-transgenic animals.
4.	They are used because they do not require ethical approval for experiments.

75 Which of the following is not an application of genetically modified organisms currently in use?

1.	Production of therapeutic drugs
2.	Production of disease-resistant crop varieties
3.	Transplantation of heart, kidney and liver
4.	Synthesis of human insulin

ETHICAL ISSUES

76 The name Genetic Engineering Approval Committee [GEAC] has been changed to:

1.	Genetic Engineering Advisory Committee
2.	Genetic Engineering Appellate Committee
3.	Genetic Engineering Appraisal Committee
4.	Genetic Engineering Arbitration Committee

77 Match each item in Column I with one in Column II and select the answer from the codes given below:

	Column I		Column II
A.	Bioprospecting	a.	the process of discovery and commercialization of new products based on biological resources
B.	Biopiracy	b.	the exploitative patenting of already widely used natural resources, such as plant varieties, by commercial entities
C.	Bioremediation	c.	a process that uses microorganisms or their enzymes to treat polluted sites for regaining their original condition
D.	Biofortification	d.	the process by which the nutritional quality of food crops is improved through agronomic practices, conventional plant breeding, or modern biotechnology

Codes

Options:	A	B	C	D
1.	a	b	c	d
2.	a	b	d	c
3.	b	a	c	d
4.	b	a	d	c

78 Identify the incorrect statement:

1.	There are 27 documented varieties of Basmati grown in India.
2.	In 1997, an American company got patent rights on Basmati rice by biopiracy.
3.	Indian Basmati was crossed with semi-dwarf varieties and claimed as aan invention or a novelty.
4.	There are an estimated 200 varieties of rice in India alone.

79 Exploring molecular, genetic, and species-level diversity for products of economic importance unethically appropriated and without fair compensation to indigenous people is called:

1.	Bioprospecting	2.	Bioremediation
3.	Biopiracy	4.	Biofortification

80 Biopiracy is:

1.	the exploration of natural sources for small molecules, macromolecules and biochemical and genetic information that could be developed into commercially valuable products.
2.	exploitation of a region's biological resources or indigenous knowledge unethically and without providing fair compensation.
3.	the use of living organisms, like microbes and bacteria, in the removal of contaminants, pollutants, and toxins from soil, water, and other environments
4.	the process of developing a crop with bioavailable micronutrients in its edible parts.

81 Consider the given tow statements:

Statement I:	The biological significance of manipulation of living organisms by humans is important.
Statement II:	Genetic modification of organisms can have unpredictable results when such organisms are introduced into the ecosystem.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

82 How many documented varieties of Basmati are grown in India?

1. 27
2. 1000
3. 50,000
4. 200,000

BIOTECHNOLOGY AND ITS APPLICATIONS - ANSWER KEY

1.	(4)	2.	(4)	3.	(2)	4.	(1)	5.	(2)	6.	(2)	7.	(4)	8.	(1)	9.	(1)	10.	(3)
11.	(3)	12.	(4)	13.	(4)	14.	(4)	15.	(3)	16.	(4)	17.	(4)	18.	(4)	19.	(1)	20.	(1)
21.	(3)	22.	(3)	23.	(1)	24.	(2)	25.	(3)	26.	(1)	27.	(4)	28.	(3)	29.	(3)	30.	(2)
31.	(1)	32.	(3)	33.	(3)	34.	(4)	35.	(1)	36.	(3)	37.	(3)	38.	(2)	39.	(1)	40.	(2)
41.	(4)	42.	(3)	43.	(2)	44.	(3)	45.	(2)	46.	(2)	47.	(3)	48.	(4)	49.	(4)	50.	(2)
51.	(3)	52.	(2)	53.	(3)	54.	(2)	55.	(3)	56.	(1)	57.	(4)	58.	(2)	59.	(1)	60.	(2)
61.	(3)	62.	(3)	63.	(1)	64.	(1)	65.	(1)	66.	(4)	67.	(1)	68.	(4)	69.	(1)	70.	(1)
71.	(3)	72.	(3)	73.	(1)	74.	(2)	75.	(3)	76.	(3)	77.	(1)	78.	(4)	79.	(3)	80.	(2)
81.	(1)	82.	(1)																

ORGANISMS AND POPULATIONS

INTRODUCTION

1 Identify the correct statements:

I.	Ramdeo Misra is revered as the Father of Ecology in India.
II.	Ecology studies the interactions among organisms and between the organism and its physical [abiotic] environment.
III.	The study of Ecology begins at cellular biological organisation level.
IV.	Ecology at the organism level is essentially physiological ecology.

1.	Only I and II	2.	All except III
3.	Only II, III and III	4.	I, II, III and IV

POPULATIONS

2 In ecological terms, a population should be defined as a group of:

1. Communities in an ecosystem
2. Species in a community
3. Individuals in a family
4. Individuals in a species

3 For the purpose of ecological studies:

I:	the level of biological organization, where the study is begun, is the organism.
II:	a group of individuals resulting from asexual reproduction is also considered a population.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

4 To evolve the desired traits, natural selection operates at the level of:

1. Organism
2. Population
3. Species
4. Biological community

5 Consider the given two statements:

Statement I:	An individual may have births and deaths, but a population has birth rates and death rates.
Statement II:	An individual is either a male or a female but a population has a sex ratio.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

6 In a pond, there were 20 lotus plants last year. If through reproduction 4 new lotus plants are added, the number of offspring per lotus per year would be:

1.	0.2	2.	0.4
3.	2.0	4.	4.0

7 If in a pond, there were 20 lotus plants last year and 8 plants died in a year, taking the current population to 12, the death rate of lotus plants in this pond will be:

1.	8 offspring per lotus per year
2.	12 offspring per lotus per year
3.	0.8 offspring per lotus per year
4.	0.4 offspring per lotus per year

8 Which of the following will not be an attribute of a population but will be an attribute of an individual?

1. Birth rate
2. Death
3. Death rate
4. Sex ratio

9 An attribute present only in a population and not in an individual will be:

1.	Birth	2.	Death
3.	Sex	4.	Sex ratio

10 A population with a population pyramid that has an extremely broad base will most likely be:

1.	a rapidly expanding population
2.	a stable population
3.	a population where the birth rate equaled the death rate
4.	a population where there were more old than young individuals

11 A population has more young individuals compared to older individuals. What would be the status of the population after some years?

1. It will decline
2. It will stabilize
3. It will increase
4. It will first decline and then stabilize

12 Figure A is population pyramid for India in 1971 and Figure B is population pyramid for India in 2024. What conclusions can be drawn from the given figures?

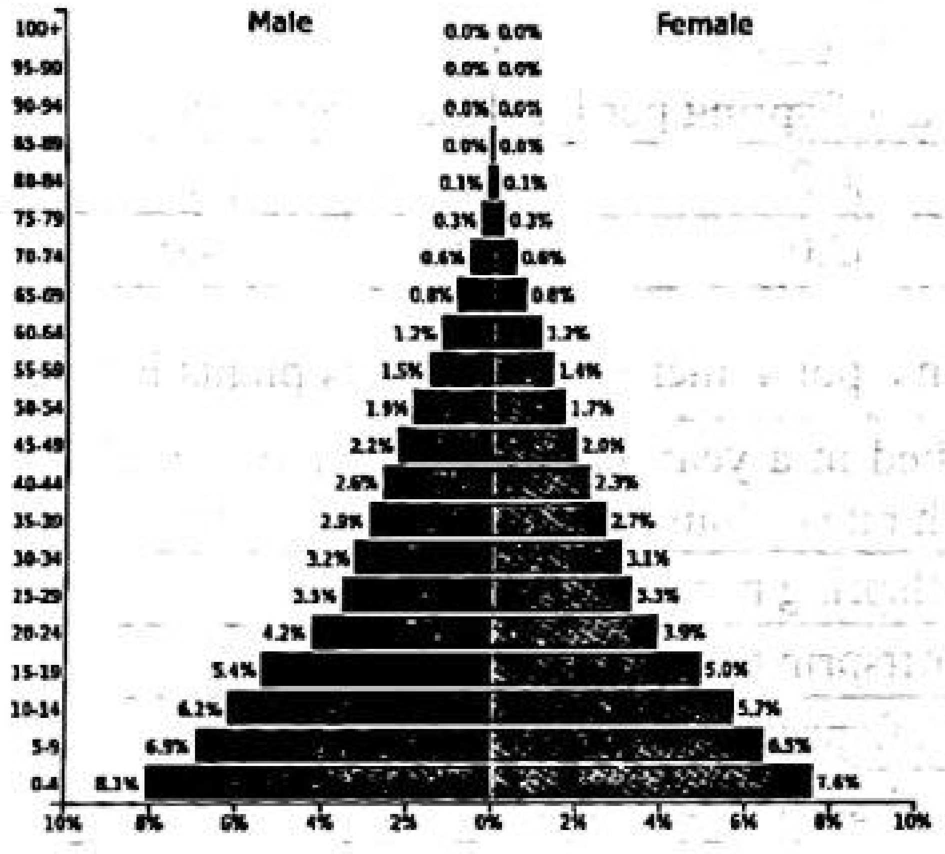


Figure A

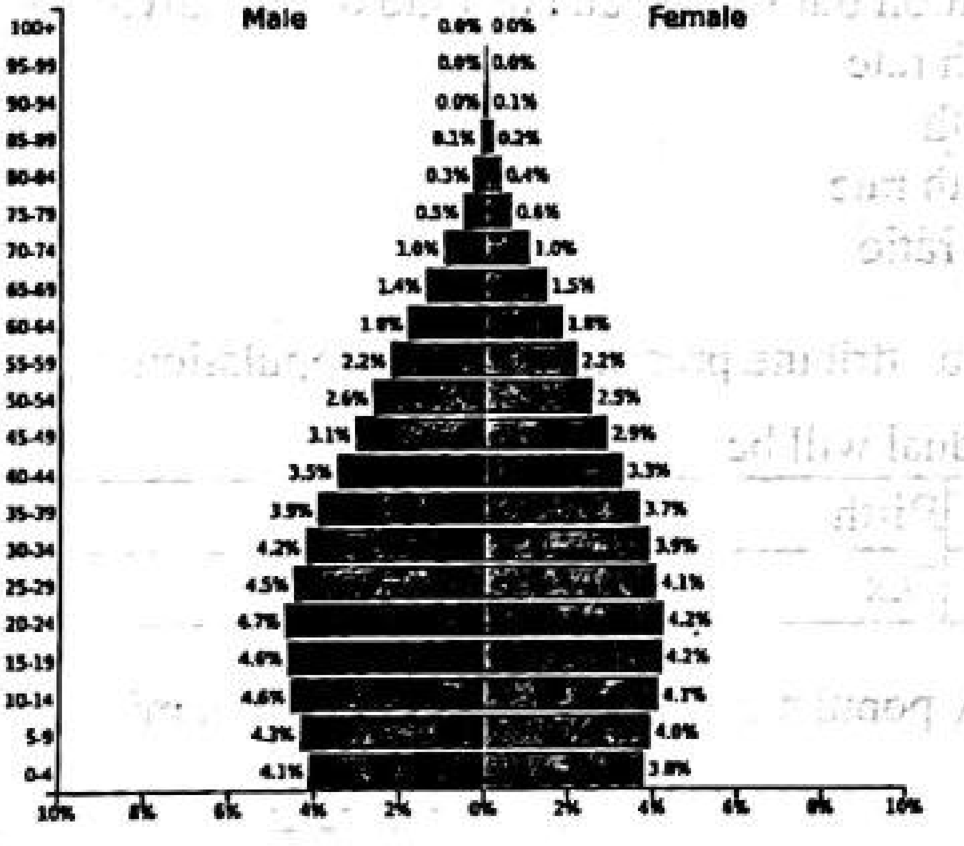
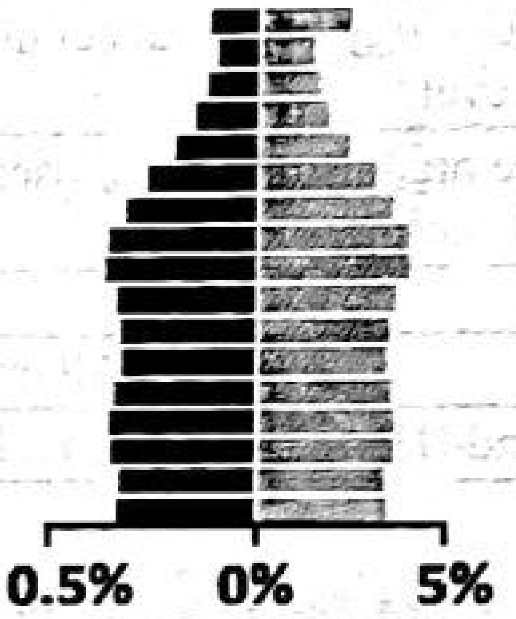


Figure B

I:	The population of India has reduced over the given period of time.
II:	India has become the most populous country in 2024

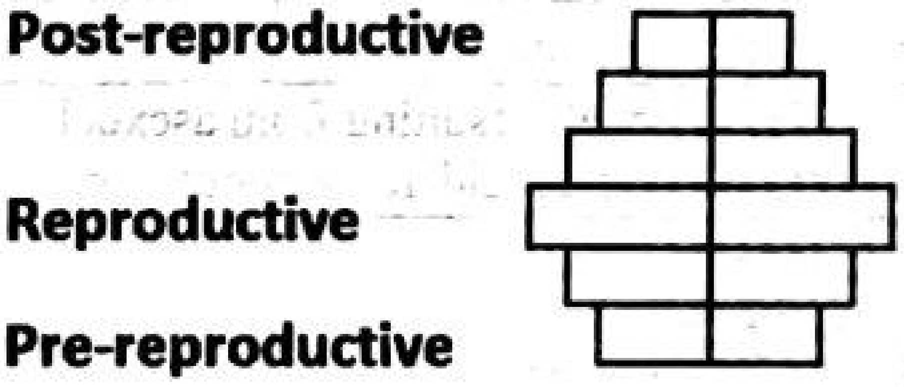
1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

13 You can see a concave shape in the upper part of the population pyramid shown in the given figure. This might signify:



1. High birth rates
2. Low birth rates
3. High life expectancy
4. Rapid population decline

14 What can be predicted about the growth status in coming future of the population for which the age sex pyramid is shown below?



1.	It will remain stable
2.	It will grow in size
3.	It will decline in size
4.	Nothing can be predicted on the basis of the given pyramid

15 Age pyramids are graphical representations that show the population distribution of:

1. Different species within an ecosystem.
2. Males and females in a population.
3. Various age groups within a population.
4. The population density of different habitats.

16 A keystone species in a biological community:

1. is the primary producer.
2. has no significant impact on the community.
3. plays a crucial role in maintaining community structure.
4. is a rare species that must be preserved immediately.

17 Consider the given two statements:

Assertion (A):	The tiger census in our national parks and tiger reserves is often based on pug marks and fecal pellets.
Reason (R):	For ecological investigations, it is mandatory to know the absolute population densities in all instances.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. **(A)** is True but **(R)** is False
3. **(A)** is False but **(R)** is True
4. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

18 Ultimately the size of a population in a given area is determined by:

1. the biotic potential
2. mortality rates and natality rates
3. carrying capacity of its environment
4. rate of immigration and emigration

19 What process from the ones given below will lead to an increase in population size?

I:	Natality
II:	Mortality
III:	Immigration
IV:	Emigration

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **III** and **IV**
4. Only **II** and **IV**

20 What process from the ones given below will lead to a decrease in population size?

I:	Natality
II:	Mortality
III:	Immigration
IV:	Emigration

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **III** and **IV**
4. Only **II** and **IV**

21 Under normal circumstances, which of the following are not important factors influencing population density in an area?

I:	Natality
II:	Mortality
III:	Emigration
IV:	Immigration

1. **I** and **II**
2. **III** and **IV**
3. **I** and **III**
4. **II** and **IV**

22 Imagine a land area is getting newly colonized by humans for the first time. The population in this area will primarily be decided by:

1. Natality
2. Mortality
3. Immigration
4. Emigration

23 If ‘N’ is the population density at time ‘t’, then its density at time ‘t+1’ is:

I.	$N_{t+1} = N_t + [(B+I) - (D+E)]$
II.	B is a measure of Natality and D is a measure of Mortality
III.	If (B+I) is less than (D+E), the population density will increase

1.	Only I and II are correct	2.	Only I and III are correct
3.	Only II and III are correct	4.	I, II and III are correct

24 All the following are correct about the exponential growth of population except:

1.	It is represented by the equation dt/dN = rN
2.	Resources in the habitat are unlimited
3.	The rate of natural increase is represented by “r”
4.	In 1981, the ‘r’ value for human population in India was 0.0205

25 When population density is plotted against time, the exponential growth curve is:

1.	S shaped	2.	Straight line
3.	J shaped	4.	Hyperbola

26 Which of the following is/are true for the given equation?

$N_t = N_0 e^{rt}$

I.	It is the integral form of exponential growth equation
II.	The rate of natural increase is represented by “r”
III.	“e” is the base of natural logarithm [2.71828]

1.	I and II only	2.	I and III only
3.	II and III only	4.	I, II and III

27 In the formula for exponential growth (dN/dt = rN), what does ‘r’ stand for?

1.	the carrying capacity of the environment
2.	the change in time
3.	the number of individuals in the population
4.	the intrinsic rate of natural increase of the population

28 Consider the given two statements:

Assertion (A):	When resources in the habitat are unlimited, the population grows in an exponential or geometric fashion.
Reason (R):	When resources in the habitat are unlimited, each species has the ability to realise fully its innate potential to grow in number.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

29 The correct equation for exponential population growth will be:

1. dN/dt = r + N
2. dN/dt = r/N
3. dN/dt = r N
4. dN/dt = r – N

30 The Verhulst – Pearl equation represents what type of population growth?

1.	Exponential	2.	Logistic
3.	Decline	4.	Stable

31 In the logistic growth equation given below, the carrying capacity is represented by:

$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

1.	N	2.	r
3.	K	4.	K – N / K

32 The growth rate of a natural population will exactly be zero when:

1. The population size and carrying capacity are exactly equal.
2. The population size nears the carrying capacity of the habitat.
3. The ratio of population size and carrying capacity is zero.
4. Mortality is greater than natality.

33

Assertion(A):	The logistic growth model is considered a more realistic one for a population growing under natural conditions.
Reason (R):	Resources for growth for most animal populations are finite and become limiting sooner or later.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False
4. Both **(A)** and **(R)** are False

34 Logistic growth in a population is characterized by:

1. A constant rate of growth regardless of population size.
2. An exponential growth followed by a stabilization at the carrying capacity.
3. Decrease in population size after reaching the carrying capacity.
4. A linear increase in population size over time.

35 Consider the given two statements:

Assertion (A):	In logistic population growth, the growth rate decreases as the population reaches carrying capacity.
Reason (R):	Resources begin to become scarce, leading to increased mortality and decreased birth rates.

1. Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3. **(A)** is True but **(R)** is False.
4. **(A)** is False but **(R)** is True.

36 Darwinian fitness is represented by:

1.	Low r value	2.	High r value
3.	High K value	4.	Low K value

37 An orchid growing as an epiphyte on a mango branch is a classical example of:

1. Parasitism
2. Mutualism
3. Commensalism
4. Predation

38 Determine which of the following statements about reproductive strategy of populations much below the carrying capacity is most likely to be correct?

1. They typically inhabit stable environments.
2. They produce a few offspring with high survival rates.
3. They have a high intrinsic growth rate.
4. They reproduce multiple times in their life and have a very long life span

39 What reproductive strategy has evolved for most birds and mammals?

1.	They breed many times during their lifetime and produce a small number of large-sized offspring.
2.	They breed only once during their lifetime and produce a small number of large-sized offspring.
3.	They breed many times during their lifetime and produce a large number of small-sized offspring.
4.	They breed only once during their lifetime and produce a large number of small-sized offspring.

40 Which of the following is an example of life history variation in organisms?

I:	Turtles lay hundreds of eggs in sandy beaches.
II:	Elephants living up to 70 years and having few offspring.
III:	Bacteria dividing every 20 minutes under optimal conditions.

1. **I** and **II** only
2. **II** and **III** only
3. **I** and **III** only
4. **I, II** and **III**

41 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In every species, there are trade-offs between survival and reproductive traits.
Reason (R):	Life history traits are products of natural selection.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

42 A population interaction that is detrimental to both species would be:

1.	Mutualism	2.	Competition
3.	Predation	4.	Amensalism

43 A population interaction where one species is harmed whereas the other is unaffected is called as:

1.	Mutualism	2.	Competition
3.	Predation	4.	Amensalism

44 Identify the incorrectly matched pair:

	Population interaction	Species A	Species B
1.	Mutualism	+	+
2.	Predation	+	-
3.	Parasitism	-	-
4.	Commensalism	+	0

45 Amensalism is a biological interaction where:

1.	an organism inflicts harm to another organism without any costs or benefits received by itself.
2.	two species interact but do not affect each other.
3.	one organism benefits and the other organism is neither benefited nor harmed.
4.	species derive a mutual benefit.

46 In their interactions with each other, both the species:

I:	benefit in mutualism
II:	lose in competition

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

47 Predation is an ecological interaction that:

1.	Always results in the death of the predator.
2.	Has no impact on the population size of the prey.
3.	Can regulate population sizes and maintain species diversity.
4.	Decreases biodiversity by eliminating weaker species.

48 Parasitism is an ecological interaction where:

1.	Both species benefit
2.	The parasite benefits at the expense of the host
3.	Both species are harmed
4.	The host benefits at the expense of the parasite

49 Consider the given two statements:

Statement I:	In predation, parasitism and commensalism, the interacting species live closely together.
Statement II:	In predation, parasitism and commensalism, one of the interacting species benefits and the other suffers harm.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

50 In broad ecological context, all the following would be considered examples of predation except:

1. Tiger eating deer
2. Sparrow eating seed
3. Cow eating herbs
4. Earthworm feeding on detritus

51 Predators do not:

1.	act as 'conduits' for energy transfer across trophic levels
2.	keep prey populations under control
3.	over-exploit their prey
4.	help in maintaining species diversity in a community

52 Consider the given two statements:

Statement I:	Predators in nature are 'prudent'.
Statement II:	Prey species have evolved various defenses to lessen the impact of predation.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

53 How many of the given statements are true?

I:	For plants, herbivores are the predators.
II:	Nearly 75 percent of all insects are known to be phytophagous.
III:	Thorns in plants are the most common morphological means of defense against herbivory.
IV:	Cardiac glycosides produced by certain plants can be very detrimental to the health of herbivores.

1. 1
2. 2
3. 3
4. 4

54 Consider the given two statements:

Assertion (A):	Predators help in maintaining species diversity in a community.
Reason (R):	Predators reduce the intensity of competition among competing prey species.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

55 Consider the two statements:

I:	Cryptically coloured animals are able to avoid being detected easily by the predator.
II:	Cryptically coloured animals blend in with their surroundings.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

56 In a field experiment, when all *Pisaster* starfish were removed from an enclosed intertidal area, the result was:

1.	Increase in diversity of invertebrates
2.	Extinction of many invertebrate species
3.	Inability of the *Pisaster* to enter the area again
4.	Replacement of *Pisaster* by other starfish

57 In Australia, the prickly pear cactus, when introduced, became invasive, primarily because:

1. It had no predator
2. It did not produce any secondary metabolite
3. It formed new mycorrhizal associations
4. It lost its horns

58 The invasive prickly pear cactus in Australia was brought under control with the help of:

1.	Snail	2.	Moth
3.	Ladybug	4.	Fungus

59 When certain exotic species are introduced into a geographical area, they become invasive mainly because:

1.	The invaded land has unlimited resources for the introduced species
2.	The invaded land does not have its natural predator
3.	The population of the introduced species in the invaded land is very low
4.	Introduced species do not face any competition in the introduced land

60 The monarch butterfly acquires distasteful toxin during:

1.	Caterpillar stage by feeding on a poisonous weed
2.	Caterpillar stage by feeding on sap of a grass
3.	Adult stage by feeding on nectar of a flowering plant
4.	Adult stage by feeding on latex of deadly night shade plant

61 About what percent of all insects is phytophagus?

1.	1 %	2.	25 %
3.	65 %	4.	99 %

62 The most common means of morphological defense in plants against herbivory are:

1.	Spines	2.	Thick cuticle
3.	Thorns	4.	Slime

63 Nicotine, caffeine, quinine and opium produced by plants are actually:

1.	Primary metabolites needed in reproduction
2.	Secondary metabolites needed for growth
3.	Alkaloids that are present in seeds
4.	Defenses against grazers and browsers

64 An abandoned field has luxuriant growth of Calotropis but cattle and goats are not seen browsing in this field because Calotropis produces:

1. stipules
2. thorns
3. mustard oils
4. cardiac glycosides

65 When Darwin spoke of the struggle for existence, he was convinced that a potent force in organic evolution is:

1.	Intraspecific competition	2.	Interspecific competition
3.	Intraspecific mutualism	4.	Interspecific mutualism

66 Consider the given two statements:

Assertion (A):	Competition can be avoided even if two species compete for the same resource.
Reason (R):	Totally unrelated species could also compete for the same resource.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is False but **(R)** is True
4.	**(A)** is True but **(R)** is False

67 In some shallow American lakes, unrelated visiting Flamingoes and resident fishes compete for the common food which is:

1.	Crustaceans	2.	Zooplankton
3.	Cichlid fishes	4.	Prawns

68 When the feeding efficiency of one species is reduced due to the inhibitory presence of the other species, even if resources are abundant, it is called:

1.	Interference competition	2.	Exploitative competition
3.	Amensalism	4.	Predation

69 Consider the given statements regarding competition amongst organisms:

I:	Only related species can compete for the same resource
II:	Competition occurs only when the resources are limiting

The correct statement/s is/are:

1.	I alone	2.	II alone
3.	Both I and II	4.	Neither I nor II

70 A process in which the fitness of one species is significantly lower in the presence of another species, is termed as :

1.	Predation	2.	Parasitism
3.	Competition	4.	Amensalism

71 Abingdon tortoise in Galapagos islands became extinct within a decade after goats were introduced on the island due to:

1. Habitat fragmentation
2. Better browsing efficiency of goats
3. Predator of goat attacking tortoise
4. Virus of goats parasitizing tortoise

72 The 'Competitive Exclusion Principle' was given by:

1.	Gause	2.	Connell
3.	Tillman	4.	Paul Ehrlich

73 A species whose distribution is restricted to a small geographical area because of the presence of a competitively superior species, is found to expand its distributional range dramatically when the competing species is experimentally removed. This is called:

1.	Competitive Exclusion	2.	Competitive Release
3.	Competitive Supremacy	4.	Competitive Inclusion

74 "Competitive Exclusion Principle" may be true if:

1.	The competing species are equally capable
2.	Resource partitioning occurs
3.	There is only intraspecific competition
4.	Resources are limiting

75 In general, competition has the least impact on:

1.	Plants	2.	Herbivores
3.	Carnivores	4.	Both 1 and 2

76 "Two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually" – the statement is often described as:

1.	Gause 's competitive exclusion principle
2.	Connell's competitive release hypothesis
3.	McArthur's resource partitioning hypothesis
4.	Humboldt's species – area relationship

77 The field experiment on barnacles to demonstrate competitive release was performed by:

1.	Gause	2.	Connell
3.	Ehrlich	4.	Tilmann

78 One mechanism that promotes co-existence rather than exclusion amongst competing species is:

1.	Periodic migration	2.	Hibernation and aestivation
3.	Resource partitioning	4.	Reproductive isolation

79 MacArthur showed that five closely related species of warblers living on the same tree were able to avoid competition and co-exist due to:

1.	Behavioral differences in their foraging activities.
2.	Pre-zygotic reproductive isolation mechanisms
3.	Physiological differences in acclimatization
4.	Gene differentiation

80 The process of reciprocal evolutionary change that occurs between species or groups of species as they interact with one another is called as:

1. Character displacement
2. Coevolution
3. Competition
4. Resource partitioning

81 Parasites, especially endoparasites, are highly adapted to their lifestyles. They are generally characterised with all of the following except:

1. the loss of unnecessary sense organs
2. presence of adhesive organs or suckers to cling on to the host
3. loss of digestive system
4. low reproductive capacity

82 How do predation and parasitism differ?

1. Predation is a symbiotic relationship, while parasitism is not.
2. Predation benefits both the predator and the prey, while parasitism benefits only the parasite.
3. Parasitism involves larger organisms consuming smaller ones, whereas predation can occur between organisms of any size.
4. Predation results in the death of the prey, while parasitism does not usually kill the host immediately.

83 Consider the two given statements:

I:	The life cycles of endoparasites are more complex than that of the ectoparasites.
II:	The morphological and anatomical features of endoparasites are greatly simplified.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct but **II** is incorrect
4. Both **I** and **II** are incorrect

84 The human liver fluke depends on two intermediate hosts that are:

1. A crustacean and a fish
2. A snail and a fish
3. An echinoderm and a fish
4. Fishes of two different species

85 Consider the given two statements:

Assertion(A):	The female Anopheles mosquito is not considered a parasite.
Reason (R):	It actually is an ectoparasite and not an endoparasite.

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3. **(A)** is True; **(R)** is False
4. Both **(A)** and **(R)** are False

86 Which of the following is not an example of an ectoparasite?

1. Lice on humans
2. Ticks on dogs
3. Copepods infesting marine fish
4. Malarial parasite developing in human RBC

87 *Cuscuta* [dodder]:

I:	is a parasitic plant that is commonly found growing on hedge plants
II:	has lost its chlorophyll and leaves in the course of evolution.

1. only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

88 Parasitic plants develop roots that penetrate the tissu of the host plant and suck it. Such roots are known as

1. Buttress roots
2. Haustoria
3. Pneumatophores
4. Epiphytic roots

89 Cuckoos laying their eggs in the nests of crow is an example of:

1. Ectoparasitism
2. Endopararsitism
3. Hyperparasitism
4. Brood parasitism

90 An orchid growing as an epiphyte on a mango branch is an example of:

1.	Ectoparasitism	2.	Endopararsitism
3.	Commensalism	4.	Mutualism

91 All the following relations are examples of commensalism except:

1.	Sea anemone and clown fish
2.	Cattle egret and grazing cattle
3.	Barnacles growing on the back of whale
4.	*Cuscuta* growing on hedge plants

92 The number of correctly matched pairs from the given pairs is:

I.	Flamingos visiting American lakes and resident fishes	Commensalism
II.	Yucca plant and *Tegeticula yuccasella,* the yucca moth	Mutualism
III.	Female Anopheles and humans	Parasitism
IV.	Lichens	Predation

1. 1
2. 2
3. 3
4. 4

93 Which of the following is least likely to affect the size of a population?

1.	Competition	2.	Brood parasitism
3.	Commensalism	4.	Predation

94 Which of the following is/are example of commensalism?

I:	The cattle egret and grazing cattle.
II:	Sea anemone that has stinging tentacles and the clown fish that lives among them.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

95 Which of the following examples is the least likely to represent commensalism?

1.	An orchid plant growing on the branches of a large tree.
2.	A type of barnacle that attaches itself to the whales it finds and feeds on plankton in the surrounding water.
3.	A clownfish that lives among the tentacles of a sea anemone, gaining protection from predators.
4.	A tapeworm living inside the intestines of an animal host and absorbing nutrients from the host's food.

96 Lichens represent an intimate mutualistic relationship between a fungus and:

1.	an algae	2.	a cyanobacterium
3.	a brown alga	4.	either 1 or 2

97 How many of the given statements are true?

I:	The most spectacular and evolutionarily fascinating examples of mutualism are found in plant-animal relationships.
II:	Plants need the help of animals for pollinating their flowers and dispersing their seeds.
III:	Animals have to be paid 'fees' for the services that plants expect from them.
IV:	Plants offer rewards or fees in the form of pollen and nectar for pollinators and juicy and nutritious fruits for seed dispersers.

1. 1
2. 2
3. 3
4. 4

98 Consider the give two statements:

I:	The relationship between nectar-feeding birds and flowers represents mutualism.
II:	The evolution of the flower and its pollinator species are not linked and are entirely independent of each other.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

99 Consider the given two statements:

Assertion(A):	The evolutions of the flower and its pollinator species are tightly linked with one another
Reason (R):	The mutually beneficial system should also be safeguarded against 'cheaters'.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False
4.	Both **(A)** and **(R)** are False

100 The fig tree is pollinated by a:

1.	Honeybee	2.	Wasp
3.	Bird	4.	Moth

101 To get pollinated by a bee, the Mediterranean Orchid, *Ophrys*, employs:

1. Sexual deceit
2. Pseudo-copulation
3. Reward in the form of nectar
4. Place for laying eggs

ORGANISMS AND POPULATIONS - ANSWER KEY

1.	(2)	2.	(4)	3.	(3)	4.	(2)	5.	(1)	6.	(1)	7.	(4)	8.	(2)	9.	(4)	10.	(1)
11.	(3)	12.	(4)	13.	(3)	14.	(3)	15.	(3)	16.	(3)	17.	(2)	18.	(3)	19.	(2)	20.	(4)
21.	(2)	22.	(3)	23.	(1)	24.	(1)	25.	(3)	26.	(4)	27.	(4)	28.	(1)	29.	(3)	30.	(2)
31.	(3)	32.	(1)	33.	(1)	34.	(2)	35.	(1)	36.	(2)	37.	(3)	38.	(3)	39.	(1)	40.	(4)
41.	(2)	42.	(2)	43.	(4)	44.	(3)	45.	(1)	46.	(3)	47.	(3)	48.	(2)	49.	(3)	50.	(4)
51.	(3)	52.	(1)	53.	(3)	54.	(1)	55.	(3)	56.	(2)	57.	(1)	58.	(2)	59.	(2)	60.	(1)
61.	(2)	62.	(3)	63.	(4)	64.	(4)	65.	(2)	66.	(2)	67.	(2)	68.	(1)	69.	(4)	70.	(3)
71.	(2)	72.	(1)	73.	(2)	74.	(4)	75.	(3)	76.	(1)	77.	(2)	78.	(3)	79.	(1)	80.	(2)
81.	(4)	82.	(4)	83.	(2)	84.	(2)	85.	(3)	86.	(4)	87.	(3)	88.	(2)	89.	(4)	90.	(3)
91.	(4)	92.	(1)	93.	(3)	94.	(3)	95.	(4)	96.	(4)	97.	(4)	98.	(1)	99.	(1)	100.	(2)
101.	(1)																		

ECOSYSTEM

INTRODUCTION

1 A functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment, is called as:

1.	A population	2.	A species
3.	A biological community	4.	An ecosystem

2 Consider the given two statements:

I:	Anthropogenic actions can have significant effect on natural ecosystems.
II:	An aquarium is considered as a man made ecosystem.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

ECOSYSTEM - STRUCTURE AND FUNCTION

3 Physical structure of an ecosystem:

I:	is same for all types of ecosystems.
II:	is the result of interaction of biotic and abiotic components.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

4 Vertical distribution of different species occupying different levels in an ecosystem is called:

1.	edge effect	2.	ecotone
3.	stratification	4.	canopy structure

5 Energy flow and nutrient cycling are two important components of an ecosystem. What will be true comparison of the two?

1.	The amount of energy is much greater than the amount of nutrients
2.	Organisms always need nutrients, but they don't always need energy
3.	Nutrients are recycled, but energy is not
4.	Organisms always need energy, but they don't always need nutrients

6 Consider the given two statements:

Assertion (A):	Temperature is the most important abiotic factor affecting living organisms.
Reason (R):	Temperature affects enzyme kinetics.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

7 Of the given two statements:

I:	A constant input of solar energy is the basic requirement for almost all ecosystems to function and sustain.
II:	There is unidirectional movement of energy towards the higher trophic levels and its dissipation as heat to the environment.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

PRODUCTIVITY

8 Consider the given two statements:

I:	Primary production of an ecosystem is expressed in terms of weight (gm^{-2}) or energy ($kcal\ m^{-2}$).
II:	Productivity of an ecosystem is expressed in terms of $gm^{-2}\ yr^{-1}$ or $(kcal\ m^{-2})\ yr^{-1}$.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

9 The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis is:

1. Primary production
2. Primary productivity
3. Secondary production
4. Secondary productivity

10 Productivity is the rate of production of biomass expressed in terms of :

i. $(kcal\ m^{-3})\ yr^{-1}$
ii. $g\ m^{-2}\ yr^{-1}$
iii. $g\ m^{-1}\ yr^{-1}$
iv. $(kcal\ m^{-2})\ yr^{-1}$

1.	ii	2.	iii
3.	ii and iv	4.	i and iii

11 In an ecosystem, the rate of production of organic matter during photosynthesis is called as its:

1.	Gross Primary productivity
2.	Net Primary productivity
3.	Secondary productivity
4.	Non productivity

12 Net primary productivity is the gross primary productivity minus:

1.	that which is consumed by herbivores
2.	that which is consumed by the producer in metabolism
3.	secondary productivity
4.	loss due to mortality

13 The annual net primary productivity of whole biosphere is approximately:

1.	25 billion tons	2.	55 billion tons
3.	70 billion tons	4.	170 billion tons

14 Which of the following ecosystems is most productive in terms of net primary production?

1.	Deserts	2.	Tropical rainforests
3.	Oceans	4.	Estuaries

15 The rate of formation of new organic matter by consumers in an ecosystem is known as:

1.	Gross Primary productivity
2.	Net Primary productivity
3.	Secondary productivity
4.	Non-productivity

16 What approximate percentage of the annual net primary productivity of the whole biosphere is the net primary productivity of oceans?

1. 25
2. 33
3. 66
4. 70

17 Consider the two statements:

Statement I:	Gross primary productivity (GPP) minus respiration losses (R), is the net primary productivity (NPP).
Statement II:	GPP is available for consumption by herbivores.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

18 Consider the given two statements:

Assertion (A):	GPP is always larger than NPP.
Reason (R):	NPP is the remainder of the gross production that is left after its use by the producers or plants in the process of respiration.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

19 Consider the given two statements:

Statement I:	Net primary productivity (NPP) is the amount of energy that primary producers create minus the energy they use to grow and survive.
Statement II:	Gross primary productivity (GPP) is the total amount of energy that primary producers create.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is incorrect; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

20 Which component is directly related to ecosystem productivity?

1.	Rate of plant respiration
2.	Amount of available light energy converted to chemical energy by photosynthesis
3.	Total biomass present in the ecosystem
4.	Number of consumers in the ecosystem

21 Regarding ecosystem productivity:

I:	Net primary productivity will be lower than the gross primary productivity.
II:	Secondary productivity will be higher than the primary productivity.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

22 Consider the following statements:

I:	The rate of production of organic matter during photosynthesis is called as gross primary productivity of an ecosystem.
II:	The available biomass for the consumption of heterotrophs is called secondary productivity.
III:	The low productivity of the oceans can mainly be attributed to the limited availability of nitrogen.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

DECOMPOSITION

23 Consider the given two statements:

Assertion (A):	The earthworm has been referred to as a farmer's 'friend'
Reason (R):	They help in the breakdown of complex organic matter as well as in loosening of the soil.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A).**
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A).**

24 Detritus:

I:	is dead plant remains such as leaves, bark, flowers and dead remains of animals, including fecal matter.
II:	is the raw material for decomposition.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

25 The correctly matched pairs regarding decomposition include:

I:	Fragmentation	Detritivores break down detritus into smaller particles.
II:	Leaching	Water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts.
III:	Catabolism	Bacterial and fungal enzymes degrade detritus into simpler inorganic substances.

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

26 Consider the two statements:

Assertion (A):	Detritivores play an important role as recyclers in the ecosystem's energy flow and biogeochemical cycles.
Reason (R):	Detritivores, alongside decomposers, reintroduce vital elements such as carbon, nitrogen, back into the soil, allowing plants to take in these elements and use them for growth.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

27 If decomposers go extinct on Earth:

1.	Detritivores will replace them
2.	Primary production will increase
3.	Nutrients will accumulate in dead plants and animals
4.	There will be no effect on carnivores

28 Humus:

1.	is formed by humification of detritus as the first step of decomposition in an ecosystem.
2.	is highly prone to rapid microbial action.
3.	serves as a reservoir of nutrients.
4.	is never degraded further in an ecosystem.

29 During the decomposition of complex organic matter:

I:	Fragmentation of detritus creates smaller particles.
II:	Due to leaching water-soluble inorganic nutrients get precipitated.
III:	Catabolism by fungal and bacterial enzymes degrades detritus to simple organic monomers.
IV:	Humus is highly resistant to microbial action
V:	Mineralization is a rapid process of release of inorganic nutrients from the humus

1. All except **III** are correct
2. All except **III** and **IV** are correct
3. All except **III** and **V** are correct
4. Only **III** is correct

30 Consider the given two statements:

I:	Humus has the ability to store nutrients.
II:	Humus is a colloidal substance and increases the cation-exchange capacity of the soil.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct but **II** is incorrect.
4. **I** is incorrect but **II** is correct.

31 Consider the given two statements:

Statement I:	Humus is highly resistant to microbial action and undergoes decomposition at an extremely slow rate.
Statement II:	Being colloidal in nature, humus serves as a reservoir of nutrients

1.	**Statement I** is correct; **Statement II** is incorrect
2.	**Statement I** is correct; **Statement II** is correct
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

32 The process of mineralization by micro-organisms helps in the release of:

1.	Inorganic nutrients from humus
2.	Both organic and inorganic nutrients from detritus
3.	Organic nutrients from humus
4.	Inorganic nutrients from detritus and formation of humus

33 During decomposition of detritus, the step that is performed by bacteria and fungi includes:

1. Catabolism only
2. Catabolism and fragmentation
3. Leaching and catabolism
4. Fragmentation, Leaching and Catabolism

34 Consider the given two statements:

Assertion (A):	Bacteria and fungi play a very important role in stability of an ecosystem.
Reason (R):	Bacteria and fungi are decomposers.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

35 Which statement correctly describes the processes of decomposition?

1.	Decomposition does not occur in waterlogged and frozen areas.
2.	Decomposition requires oxygen, water, and suitable temperatures.
3.	Nutrient cycling is hindered by rapid decomposition.
4.	Decomposers are typically large vertebrate animals.

36 Regarding decomposition:

Statement I:	Anaerobiosis speeds up decomposition.
Statement II:	Warm and moist conditions favor decomposition.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

37 Study the given two statements regarding the process of decomposition in an ecosystem:

I:	By the process of leaching, water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts.
II:	Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called catabolism.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

38 During decomposition of detritus, water-solub inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts by a process called:

1.	Catabolism	2.	Leaching
3.	Chelation	4.	Ion exchange

39 Decomposition rate:

I:	is slower if detritus is rich in nitrogen and water-soluble substances like sugars.
II:	is faster in warm and moist environment.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

40 Decomposition rate:

I:	is faster, if detritus is rich in in lignin and chitin.
II:	is slower in anaerobic conditions.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

ENERGY FLOW

41 About what percentage of photosynthetically active radiation (PAR) are plants able to capture?

1. 1 to 5%
2. 2 to 10%
3. 40 to 50%
4. 90 to 100%

42 What percent of the incident solar radiation is photosynthetically active radiation (PAR)?

1. only about 1 to 5
2. only about 2 to 10
3. around but less than 50
4. 90 to 95

43 Identify the correct statement regarding the energy flow in an ecosystem:

1.	About 2 to 10 % of incident solar radiation is PAR
2.	An ecosystem is exempt from the Second Law of Thermodynamics
3.	The amount of energy increases at successive trophic levels
4.	The number of trophic levels in a grazing food chain is limited

44 Consider the given two statements:

Assertion (A):	Ecosystems are not exempt from the Second Law of thermodynamics.
Reason (R):	There is a constant supply of energy to synthesise the molecules they require, to counteract the universal tendency toward increasing disorderliness.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

45 In a terrestrial ecosystem, major producers are:

1. herbaceous and woody plants.
2. phytoplankton
3. algae
4. mosses

46 Consider the given two statements:

Assertion (A):	In an ecosystem, organisms are linked through food chains and food webs.
Reason (R):	No energy that is trapped into an organism remains in it forever.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

47 Identify the incorrect statement:

1.	Death of an organism is the beginning of the detritus food chain/web.
2.	In an aquatic ecosystem, the detritus food chain (DFC) is the major conduit for energy flow.
3.	In a terrestrial ecosystem, a much larger fraction of energy flows through the detritus food chain than through the grazing food chain (GFC).
4.	Detritus food chain may be connected with the grazing food chain at some levels.

48 Regarding the given two statements:

Statement I:	Herbivores are primary consumers.
Statement II:	Primary carnivores are secondary consumers.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

49 Organisms at each trophic level depend on those at the lower level trophic level for their energy demands except:

1.	Primary consumers	2.	Secondary consumers
3.	Tertiary consumers	4.	Decomposers

50 The detritus food chain:

I:	begins with dead organic matter
II:	is the major conduit of energy flow in aquatic ecosystem.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

51 Consider the following statements:

I:	In an aquatic ecosystem, Grazing Food Chain (GFC) is the major conduit for energy flow.
II:	In a terrestrial ecosystem, Detritus Food Chain (DFC) is the major conduit for energy flow.
III:	GFC and DFC are not interconnected at any level.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II,** and **III**

52 Consider the given two statements:

Assertion (A):	Detritus food chain (DFC) may be connected with the grazing food chain (GFC) at some levels.
Reason (R):	Some of the organisms of DFC are prey to the GFC animals, and in a natural ecosystem, some animals are omnivores.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

53 A grazing food chain is different from a detritus food chain because:

I:	GFC is the major conduit of energy flow in terrestrial ecosystem.
II:	GFC begins with dead organic matter.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

54 Consider the given two statements:

Assertion (A):	The number of trophic levels in the grazin food chain is restricted.
Reason (R):	Based on the source of their nutrition or food, organisms occupy a specific place in the food chain that is known as their trophic level.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	**(A)** is True but **(R)** is False
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.

55 Consider the two statements:

I:	The number of trophic levels in the grazing food chain is restricted.
II:	The transfer of energy follows 10 per cent law – only 10 per cent of the energy is transferred to each trophic level from the lower trophic level.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

56 What does the 10 percent rule in an ecosystem refer to?

1.	10 percent of the organisms in any ecosystem are predators.
2.	Only 10 percent of an ecosystem's plants are eaten by herbivores.
3.	Approximately 10 percent of energy is transferred from one trophic level to the next higher level.
4.	10 percent of the water in an ecosystem is used by plants for photosynthesis

57 In an aquatic food chain, zooplankton occupy which trophic level?

1.	First	2.	Second
3.	Third	4.	Fourth

58 If the carbon atoms fixed by producers already have passed through three species, the trophic level of the last species would be

1.	Scavenger	2.	Tertiary producer
3.	Tertiary consumer	4.	Secondary consumer

59 Typically, least amount of energy in an ecological pyramid, will be present at the trophic level occupied by:
1. Producers
2. Primary consumers
3. Secondary consumers
4. Tertiary consumers

60 The organisms that are not a part of the second trophic level in an ecosystem will be:

1.	Zooplankton	2.	Grasshopper
3.	Phytoplankton	4.	Cow

61 A food chain typically represents:

1.	The flow of nutrients in an ecosystem.
2.	The cyclic movement of water through different trophic levels.
3.	The sequence of organisms through which energy flows in an ecosystem.
4.	The complex interrelationships of all organisms in an ecosystem.

ECOLOGICAL PYRAMIDS

62 Identify the incorrect statement:

1.	Any calculations of energy content, biomass or numbers, need not include all organisms at that trophic level.
2.	No generalisations we make will be true if we take only a few individuals at any trophic level into account.
3.	A given organism may occupy more than one trophic level simultaneously.
4.	The trophic level represents a functional level, not a species as such.

63 Identify the correct statements:

I:	Only a few individuals can be taken into account at any trophic level and the deductions may be generalised.
II:	Trophic level is a functional level and does not represent a species.
III:	A given species may occupy more than one trophic level in the same ecosystem at the same time.

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II, III** and **IV**

64 Consider the given two statements:

I:	In most ecosystems, all the ecological pyramids are largely upright.
II:	Pyramid of energy can be a notable exception to the above rule.

1. Both **I** and **II** are correct.
2. Both **I** and **II** are incorrect.
3. Only **II** is correct.
4. Only **I** is correct.

65 Pyramid of numbers is :

1. Always upright
2. Always inverted
3. Either upright or inverted
4. Neither upright nor inverted

66 The ecological pyramids that can never be inverted in a natural ecosystem include:

I:	pyramid of numbers
II:	pyramid of energy in any ecosystem
III:	pyramid of biomass in the sea

1. Only II
2. Only III
3. Only II and III
4. All can be inverted

67 In an open ocean, the pyramid of biomass is often inverted. How can this support higher trophic levels?

1.	The food produced by primary producers is of high quality
2.	The primary producers grow and reproduce at high rates
3.	Primary producers are very abundant.
4.	The predators at higher trophic levels are very efficient

68 Consider the following statements:

I:	Trophic level in an ecosystem represents a functional level, not a species as such.
II:	Saprophytes are accorded the position of a top consumer in an ecosystem.
III:	A species can occupy more than one trophic level in the same ecosystem at the same time.

Which of the above statements are true?

1.	**I and II only**	2.	**I and III only**
3.	**II and III only**	4.	**I, II, and III**

69 Consider the given two statements:

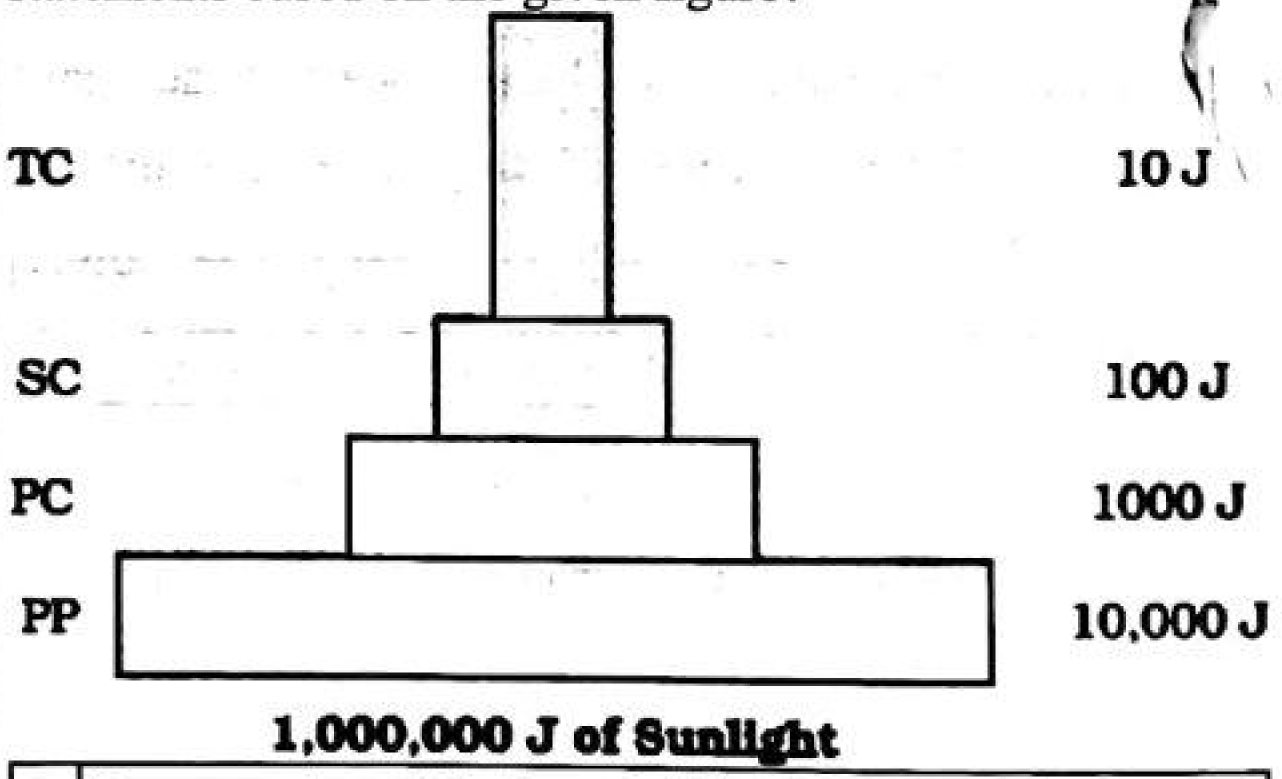
Statement I:	The pyramid of energy is always upright and can never be inverted because when energy flows from one trophic level to the next, some energy is always lost as heat at each step.
Statement II:	The pyramid of biomass in the sea is generally inverted because the biomass of fishes far exceeds that of phytoplankton.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

70 There are certain limitations of ecological pyramids including all the following except:

1.	It does not take into account the same species belonging to two or more trophic levels.
2.	It assumes a simple food chain, something that almost never exists in nature.
3.	It does not accommodate a food web.
4.	Saprophytes are given multiple levels in ecological pyramids.

71 Study the given pyramid and select the correct statements based on the given figure?



I:	It represents an ideal pyramid of energy in an ecosystem.
II:	Primary producers convert only 1% of the energy in the sunlight available to them into NPP.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

72 Ecological pyramids do not take into account:

I:	The apex predators
II:	the same species belonging to two or more trophic levels
III:	saprophytes

1. Only **I** and **II**
2. Only **I** and **III**
3. Only **II** and **III**
4. **I, II** and **III**

73 Which ecological pyramid can never be inverted in any natural ecosystem?

1.	Pyramid of numbers
2.	Pyramid of biomass
3.	Pyramid of energy
4.	All ecological pyramids can be inverted

74 Consider the given two statements:

Assertion (A):	The pyramid of biomass in sea is generally inverted.
Reason (R):	The biomass of fishes far exceeds that of phytoplankton.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

75 Consider the given two statements:

Assertion (A):	An inverted pyramid of biomass in aquatic ecosystems is not a paradox.
Reason (R):	Pyramid of biomass is always inverted in all ecosystems.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

76 An upright ecological pyramid with a base wider than the top will generally signify:

1.	Stable ecosystem
2.	Unstable ecosystem
3.	Equal distribution of energy
4.	Random distribution of energy

ECOSYSTEM - ANSWER KEY

1.	(4)	2.	(3)	3.	(2)	4.	(3)	5.	(3)	6.	(1)	7.	(3)	8.	(3)	9.	(1)	10.	(3)
11.	(1)	12.	(2)	13.	(4)	14.	(2)	15.	(3)	16.	(2)	17.	(3)	18.	(1)	19.	(1)	20.	(2)
21.	(1)	22.	(2)	23.	(1)	24.	(3)	25.	(4)	26.	(1)	27.	(3)	28.	(3)	29.	(3)	30.	(1)
31.	(2)	32.	(1)	33.	(1)	34.	(1)	35.	(2)	36.	(3)	37.	(3)	38.	(2)	39.	(2)	40.	(2)
41.	(2)	42.	(3)	43.	(4)	44.	(1)	45.	(1)	46.	(4)	47.	(2)	48.	(1)	49.	(4)	50.	(1)
51.	(1)	52.	(1)	53.	(4)	54.	(4)	55.	(3)	56.	(3)	57.	(2)	58.	(3)	59.	(4)	60.	(3)
61.	(3)	62.	(1)	63.	(3)	64.	(4)	65.	(3)	66.	(1)	67.	(2)	68.	(2)	69.	(1)	70.	(4)
71.	(3)	72.	(3)	73.	(3)	74.	(1)	75.	(3)	76.	(1)								

BIODIVERSITY AND CONSERVATION

INTRODUCTION

1 The term 'Biodiversity' to describe the combined diversity at all levels of biological organisation was popularized by:

1. Robert May
2. Paul Ehrlich
3. Edward Osborne Wilson
4. Alexander von Humboldt

BIODIVERSITY

2 The variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces is:

1. Genetic diversity
2. Species diversity
3. Ecological diversity
4. Global diversity

3 What type of biodiversity are we talking about when we say Western ghats in India have a greater amphibian species diversity than the Eastern Ghats?

1. Genetic diversity
2. Species diversity
3. Ecological diversity
4. Evolutionary diversity

4 What type of biodiversity are we talking about when we say India has more than 1000 varieties of mangoes?

1. Genetic diversity
2. Species diversity
3. Ecological diversity
4. Evolutionary diversity

5 Which of the following statements best describes biodiversity at the genetic, species, and ecosystem levels?

1.	Genetic diversity refers to the variety of genes within a species, species diversity refers to the variety of species within a habitat, and ecosystem diversity covers different types of habitats.
2.	Genetic diversity includes different ecosystems, species diversity includes different genes, and ecosystem diversity includes different species.
3.	Genetic diversity only pertains to dominant species, while ecosystem diversity pertains to all living forms.
4.	Species diversity is about abiotic factors, whereas ecosystem diversity focuses on biotic factors.

6 Match the following types of biodiversity to their examples:

	Column I		Column II
A	Genetic Diversity	P	Variations among human populations
B	Species Diversity	Q	Different fish species in the Atlantic Ocean
C	Ecosystem Diversity	R	Deserts and rainforests

Codes:

	A	B	C
1.	P	Q	R
2.	Q	P	R
3.	P	R	Q
4.	R	P	Q

7 Which statement best describes the significance of genetic diversity within a species?

1.	It decreases the adaptability of a species to environmental changes.
2.	It ensures minimal survival during catastrophic events.
3.	It enables a population to evolve over time in response to environmental changes.
4.	It is insignificant as long as species diversity is high.

8 Match each item in Column I with one in Column II and choose the correct answer from the codes given below:

	Column I		Column II
A.	Genetic diversity	a.	Western ghats have greater amphibian diversity than eastern ghats
B.	Species diversity	b.	India has more than 50000 genetically different strains of rice
C.	Ecological diversity	c.	India has more ecosystems than Norway

Codes :

	A	B	C
1.	a	b	c
2.	b	a	c
3.	c	b	a
4.	b	c	a

9 Identify the incorrect statement:

1.	Biodiversity is the term popularised by the sociobiologist Edward Wilson to describe the combined diversity at all levels of biological organisation.
2.	IUCN stands for International Union for Conservation of Nature and Natural resources.
3.	Robert May places the global species diversity in the range of 20 to 50 million.
4.	More than 25 percent of the drugs currently sold in the market are derived from the plants.

10 Approximately, what number of species have been identified, named and studied?

1.	1.0 million	2.	1.5 million
3.	1.7 million	4.	2.0 million

11 Amongst the vertebrates, the Class with maximum number of species is:

1.	Pisces	2.	Reptilia
3.	Aves	4.	Mammalia

12 Consider the given two statements:

Statement I:	Species inventories are more complete in temperate than in tropical countries.
Statement II:	Temperate countries, in general, have more biodiversity than the tropical countries.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

13 A scientifically sound estimate that the global species diversity may be about 7 million has been made by:

1.	Paul Ehlrich	2.	David Tilman
3.	Robert May	4.	MacArthur

14 How many of the given statements are correct?

I.	More than 70% of all the species recorded are animals.
II.	Among animals, insects are most species-rich taxonomic group.
III.	Angiosperms are more successful than algae and lichens put together.

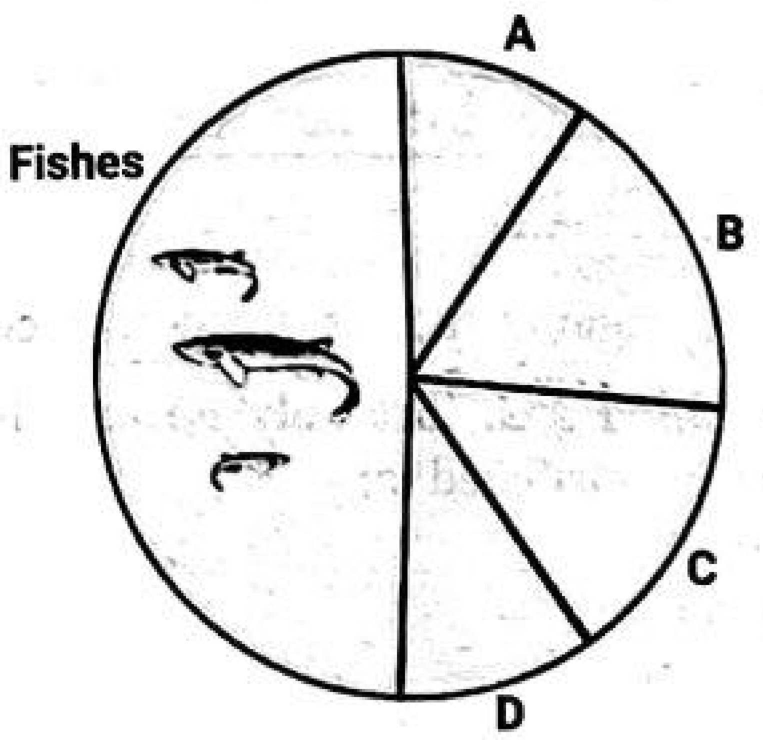
1. 0
2. 1
3. 2
4. 3

15 If we consider invertebrates, the maximum g biodiversity, after insects, is seen in:

1.	Crustaceans	2.	Echinoderms
3.	Mollusks	4.	Annelids

BIODIVERSITY AND CONSERVATION

16 In the given pie chart showing the global biodiversity of vertebrates, the Amphibians and the Birds are respectively represented by:



1.	B and D	2.	A and C
3.	A and B	4.	D and B

17 Consider the following statements:

I:	Among invertebrates, maximum species richness is seen in insects
II:	Among vertebrates, maximum species richness is seen in mammals
III:	Among plants, algae have a greater diversity than angiosperms.

1. Only **I** is correct
2. Only **II** and **III** are correct
3. Both **I** and **III** are correct
4. **I, II** and **III** are incorrect

18 After fishes, the most diverse vertebrates are:

1.	Mammals	2.	Amphibians
3.	Birds	4.	Reptiles

19 After insects and molluscs, the most diverse invertebrates are:

1.	Cnidarians	2.	Echinoderms
3.	Crustaceans	4.	Annelids

20 Consider the given two statements:

Statement I:	Biologists are not sure about how many prokaryotic species there might be.
Statement II:	Conventional taxonomic methods are not suitable for identifying microbial species and many species are simply not culturable under laboratory conditions.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

21 Although, India has only 2.4 % of world's area, its share of global species diversity is about:

1.	3%	2.	5%
3.	8%	4.	11%

22 What is the number of mega-diversity countries in the world?

1.	5	2.	12
3.	17	4.	22

23 Biodiversity loss is now one of the world's most pressing crisis. The primary reason for this is that:

1.	we cannot do anything about it
2.	we are not responsible for this loss
3.	we still do not know its entire extent
4.	it is only affecting the developing countries

24 Regarding the gradients of biodiversity:

I:	As we move from poles to the equator, broadly speaking, biodiversity decreases.
II:	There is an increase in species diversity from lower to higher altitudes.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

25 The greatest biodiversity on the earth is found in:

1.	African grasslands
2.	Amazonian rain forest in South America
3.	Western Ghats in India
4.	Nile delta in Egypt

26 Which of the following is not a reason that accounts for greater biodiversity of tropics?

1.	availability of more solar energy
2.	more niche specialization
3.	more time for species diversification
4.	large seasonal variations in environmental factors

27 Consider the two statements:

I:	Species diversity seen in tropical areas is much lower than that seen in temperate areas.
II:	Temperate areas, unlike tropical areas are less seasonal, more constant and promote niche specialization.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct but **II** is incorrect.
4. Both **I** and **II** are incorrect.

28 Given below are the characteristics used in explaining higher biodiversity in tropics. Identify the one/s that is/are correctly matched:

I.	More speciation	Less seasonal, constant environment
II.	Niche specialization	Latitudes undisturbed for millions of years
III.	Higher productivity	More solar energy is available

1.	Only **III**	2.	Only **I** and **III**
3.	**II** only	4.	None are correctly matched

29 The name of Alexander von Humboldt is associated with the concept of:

1.	Increased species diversity in stable communities
2.	Parallelism between evolution and ecological succession
3.	Resource-partitioning to avoid competition
4.	Species-Area relationship

30 'Within a region, species richness increased with increasing explored area, but only up to a limit' – this hypothesis can be attributed to:

1. Norman Myers
2. Robert Costanza
3. Alexander Humboldt
4. Eugene Odum

31 On a logarithmic scale, the species-area relationship turns out to be a:

1.	Straight line	2.	Rectangular hyperbola
3.	Bell shaped	4.	U shaped

32 On a logarithmic scale, the species area relationship is described by the equation $\log S = \log C + Z \log A$, where the regression coefficient is represented by:

1. S
2. C
3. Z
4. A

33 How many of the given statements are correct regarding the equation that describes the species area relationship on a logarithmic scale?

I:	If species area relationships are analyzed in very large areas such as entire continents, the slope of line is much steeper [z value between 0.6 to 1.2]
II:	The relationship is represented as a rectangular hyperbola.
III:	A in the equation is the Y-intercept

1. 0
2. 1
3. 2
4. 3

34 One aquarium has 10 different species of fish, 3 species of plankton, and 5 species of seaweeds. The other aquarium has 2 turtles of the same species and 100 fishes of same species. What can be said regarding the two aquariums?

I:	The first aquarium has more species diversity than the second aquarium.
II:	Over time, the community within second aquarium will be more stable than first aquarium.

1. Only **I**
2. Only **II**
3. Both **I** and **II**
4. Neither **I** nor **II**

35 'Increased biodiversity allows species to interact with each other in a useful manner, which makes the ecosystem more stable overall'. This statement can be attributed to:

1. David Tilman
2. Paul Ehrlich
3. Robert Constanza
4. Tansley

36 Consider the given two statements:

Statement I:	Communities with more species generally tend to be more stable than those with less species.
Statement II:	Within a region, species richness increases with increasing explored area, but only up to a limit.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is correct
4.	**Statement I** is incorrect; **Statement II** is incorrect

37 All the following describe a stable biological community except:

1.	It should always show a significant increase in productivity from year to year
2.	It must be either resilient or resistant to occasional natural disturbances
3.	It must be either resilient or resistant to occasional man-made disturbances
4.	It must be resistant to invasion by alien species

38 A stable biological community:

I:	should not show too much variation in productivity from year to year
II:	must be either resistant or resilient to occasional disturbances (natural or man-made)
III:	must also be resistant to invasions by alien species

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

39 David Tilman conducted long-term ecosystem experiments using outdoor plots. His findings include:

I:	Plots with more species showed less year-to-year variation in total biomass.
II:	Increased biodiversity contributed to higher productivity.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

40 The rivet popper hypothesis was given by:

1.	Humboldt	2.	Ehlrich
3.	Tilman	4.	Tansley

41 The IUCN Red List (2004) documents the extinction of how many species in past 500 years?

1. 784 species
2. 338 species
3. 359 species
4. 87 species

42 Amongst the recent extinctions, Thylacine got extinct from:

1. Mauritius
2. Africa
3. Russia
4. Australia

43 Identify the incorrectly matched pair:

1.	Dodo	Mauritius
2.	Quagga	Africa
3.	Thylacine	Australia
4.	Stellar's sea cow	USA

44 An example of recent extinctions given in the NCERT includes:

1. The dodo due to overexploitation
2. The Asiatic cheetah due to habitat loss
3. The passenger pigeon due to disease
4. The Siberian tiger due to climate change

45 Which of the following species of tiger has not gone extinct?

1.	Bali	2.	Javan
3.	Caspian	4.	Siberian

46 Which group, amongst the following, has the maximum percentage of species facing threat of extinction?

1.	Amphibians	2.	Birds
3.	Mammals	4.	Gymnosperms

47 Presently, what percent of all mammal species in the world face the threat of extinction?

1. 12
2. 23
3. 31
4. 32

48 What percent of all bird species at present face the threat of extinction?

1.	12	2.	23
3.	31	4.	32

49 The current episode of mass extinction of species on Earth:

I:	is the sixth such episode overall
II:	is faster than the previous such episodes
III:	is mainly due to anthropogenic action

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

50 The sixth mass extinction is characterized by:

1.	A natural cooling period leading to widespread glaciation.
2.	The impact of human activities on biodiversity loss.
3.	A catastrophic volcanic event that altered the Earth's climate.
4.	An asteroid impact leading to the extinction of many species.

51 Loss of biodiversity may lead to all except:

1.	decline in plant production
2.	increased resistance to environmental perturbance
3.	increased variability in water use
4.	increased variability in pest and disease cycle

52 The "Evil Quartet' - causes for loss of biodiversity do not include:

1.	Destruction of habitat
2.	Invasion by alien species
3.	Keeping animals in zoological parks
4.	Over-exploitation of natural resources

53 At present, the most important cause driving animals and plants to extinction is:

1.	Co-extinctions	2.	Alien species invasions
3.	Over-exploitation	4.	Habitat loss and fragmentation

54 Habitat loss and fragmentation lead to loss of biodiversity primarily because:

1.	less plants in fragmented habitats leads to less photosynthesis.
2.	more soil erosion takes place in fragmented habitats.
3.	smaller populations in fragmented habitats are more prone to extinction.
4.	animals migrate out of smaller habitat fragments.

55 Consider the given two statements:

I:	Fragmentation of habitat is an important cause of extinction of species.
II:	Minor fluctuations in climate, resources or other factors can be catastrophic in small, isolated populations.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct but **II** is incorrect.
4. **I** is incorrect but **II** is correct.

56 Consider the given two statements:

Assertion (A):	When large habitats are broken up into small fragments due to human activities, mammals are badly affected.
Reason (R):	Mammals require large territories.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

57 The sobriquet 'lungs of the planet Earth' is sometimes used for:

1. Taiga forest
2. Tundra forest
3. Amazon rain forest
4. Rain forests of North East India

58 Extinction of Stellar's sea cow and passenger pigeon was due to:

1.	Habitat loss and fragmentation	2.	Over exploitation
3.	Invasion of alien species	4.	Co-extinctions

59 What is common to Lates niloticus, *Lantana* Camara, and *Parthenium* hysterophorus?

1.	They all have caused the extinction of a large number of indigenous species in India.
2.	They have been extinct in the wild in the past 200 years.
3.	Transgenic varieties of these organisms are used to harvest therapeutic products.
4.	They are all examples of alien species that have become invasive in some environments where they were introduced.

60 Which of the following is not an invasive alien species in the Indian context?

1.	*Lantana*	2.	Cynodon
3.	*Parthenium*	4.	*Eichhornia*

61 Alien species invasion often leads to:

1. An increase in the genetic diversity of native species.
2. Improved ecosystem services.
3. Significant disruptions in the native ecosystem.
4. Stabilization of the affected ecosystems.

62 Introduction of Nile perch in Lake Victoria led to the dramatic decline in the population of indigenous:

1. Gambusia
2. Cichlid fish
3. Salmon fish
4. Pomfrets

63 *Parthenium* hysterophorus:

I:	is also called as carrot grass or the gajar grass.
II:	is a common invasive species in India and came as a contaminant with wheat
III:	produces allelopathic chemicals
IV:	produces pollens that are common cause of allergies in humans

1. Only **I, II** and **III** are correct
2. Only **I, II** and **IV** are correct
3. Only **II, III** and **IV** are correct
4. **I, II, III** and **IV** are correct

64 *Clarias gariepinus* is a/an:

1. African catfish
2. Indigenous Indian catfish
3. sea-weed
4. invasive plant

65 In a co-evolved highly specific plant-pollinator obligatory mutualism, if one of the members gets extinct, the other most likely:

1.	would increase in number but the diversity in the population would reduce
2.	would increase in number and the diversity in the population would increase
3.	would decrease in number and the diversity in the population would reduce
4.	also go extinct

BIODIVERSITY CONSERVATION

66 Which of the following does not provide a narrowly utilitarian argument for conservation of biodiversity?

1.	We get food and firewood.
2.	Increase in atmospheric oxygen via photosynthesis
3.	Pharmaceutical drug discovery
4.	Bioprospecting for products of economic importance

67 Consider the given two statements:

Statement I:	That humans derive countless direct economic benefits from nature is the broadly utilitarian argument for the need to conserve biodiversity.
Statement II:	That biodiversity plays a major role in many ecosystem services that nature provides is the narrowly utilitarian argument for the need to conserve biodiversity.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is incorrect
3.	**Statement I** is incorrect; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

68 Identify the correctly matched pairs:

I	Narrowly utilitarian argument for conserving biodiversity	Humans derive countless direct benefits from nature.
II.	Broadly utilitarian argument for conserving biodiversity	We owe to millions of plant, animal and microbe species with whom we share this planet
III.	Ethical argument for conserving biodiversity	Biodiversity plays a major role in many ecosystem services that nature provides

1. Only **I**
2. Only **II** and **III**
3. **I, II** and **III**
4. None

69 Biodiversity should be conserved as it plays a major role in many ecosystem services that nature provides. Such an argument is called:

1.	broadly utilitarian	2.	narrowly utilitarian
3.	ethical	4.	moral

70 What type of argument for need to conserve biodiversity am I making when I say that we all must do our best to protect the biodiversity on the Earth as the nature provides invaluable services and intangible benefits like aesthetic pleasures of being in nature?

1.	Narrowly utilitarian	2.	Broadly utilitarian
3.	Ethical	4.	Useless

71 What argument for conserving biodiversity relates to what we owe to millions of plant, animal and microbe species with whom we share this planet?

1. Narrowly utilitarian
2. Broadly utilitarian
3. Ethical
4. Useless

72 About what percent of drugs currently sold in markets worldwide are derived from plants?

1.	5	2.	10
3.	25	4.	50

73 The search for previously unknown compounds in organisms that have never been used in traditional medicine is known as:

1.	Biopiracy	2.	Bioprospecting
3.	Molecular pharming	4.	Bioremediation

74 How many of the given statements are true?

I:	Amazon rain forest produces 20% of total oxygen in the Earth's atmosphere
II:	All the biodiversity hotspots put together cover about 10 % of the Earth's land area
III:	About 23 % of all species of gymnosperms in the world face the threat of extinction
IV:	India's share of the global species diversity is about 2.4 %

1. 1
2. 2
3. 3
4. 0

75 What percentage of total oxygen in the earth's atmosphere is produced by Amazon rainforest through photosynthesis?

1.	50	2.	40
3.	30	4.	20

76 When a threatened plant needs urgent measures to save it from extinction, the desirable approach is:

1.	in-situ conservation	2.	ex-situ conservation
3.	cryopreservation	4.	biopreservation

77 Consider the given two statements:

Assertion (A):	In-situ conservation is preferred if the organism, needed to be protected, is facing a high threat of extinction.
Reason (R):	In-situ conservation is an on-site conservation where we conserve and protect the whole ecosystem.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	**(A)** is False but **(R)** is True

78 Consider the following statements regarding hotspots of biodiversity:

I.	They are characterized by high endemism and high threat of extinction.
II.	Three of the 34 hotspots in the world cover India.
III.	All biodiversity hotspots cover about 10% of the world area.

1. Only **I** and **II** are correct.
2. Only **I** and **III** are correct.
3. Only **II** and **III** are correct.
4. **I, II** and **III** are correct.

79 The biodiversity hotspots in India include all the following except:

1.	Western Ghats and Sri Lanka	2.	Indo-Burma
3.	Himalayas	4.	Deccan plateau

80 What percent of earth's area is covered by hotspots of biodiversity?

1.	less than 2	2.	about 7
3.	about 11	4.	more than 16

81 Consider the given two statements:

Assertion (A):	Global efforts to conserve biodiversity largely concentrate on the hot biodiversity spots located all over the world.
Reason (R):	Biodiversity hotspots' regions have very high levels of species richness and high degree of endemism.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

82 The number of ecological hotspots of biodiversity that cover India currently are:

1. 3
2. 12
3. 25
4. 34

83 According to your NCERT text, the number of biosphere reserves, national parks and wildlife sanctuary in India are respectively:

1.	14, 90 and 448	2.	11, 98 and 440
3.	15, 101 and 403	4.	13, 92 and 427

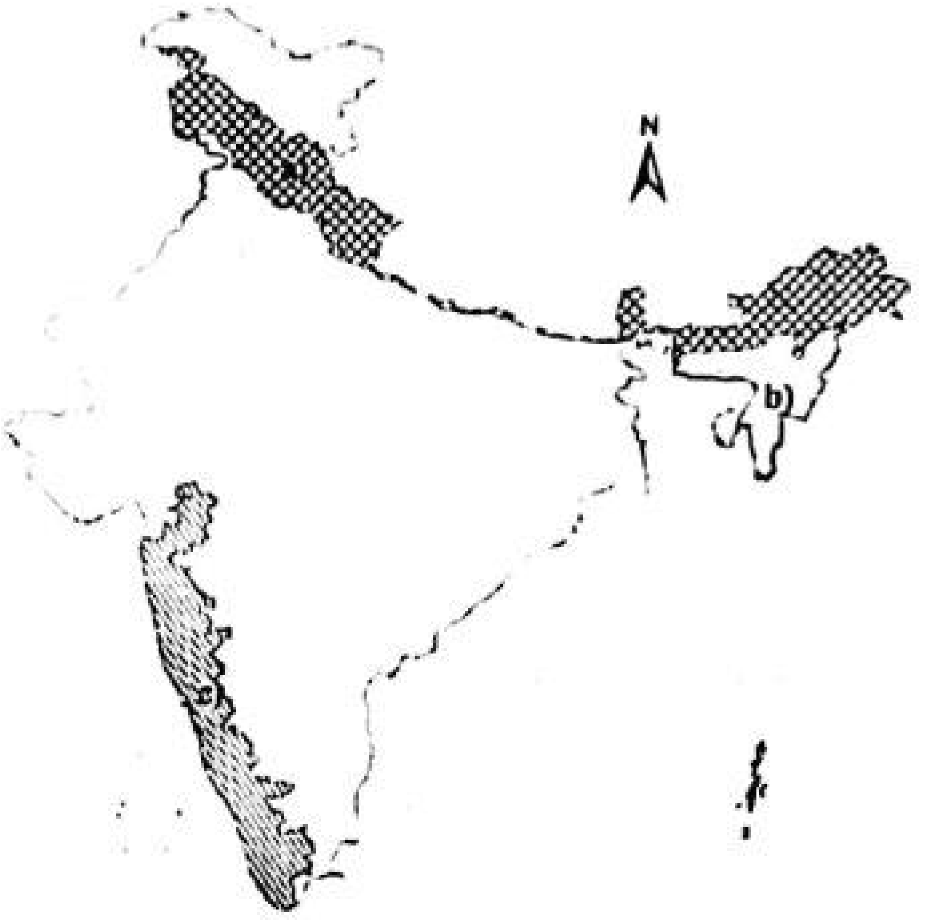
84 All the following are ex-situ methods for conservation of biodiversity except:

1.	Botanical Gardens	2.	Seed banks
3.	Plant tissue culture	4.	Biosphere Reserves

85 Biosphere reserves and sacred groves are:

1.	in-situ methods for conservation of biodiversity
2.	ex-situ methods for conservation of biodiversity
3.	always parts of some national park
4.	solitary secluded areas where human movement is forbidden by law

86 The given map of India shows:



1. The biodiversity hotspots in India
2. Seismic zones in India
3. Latest biosphere reserves of India
4. Ramsar sites in India

87 Which Indian state is the location of the sacred groves of Khasi and Jaintia hills?

1. Assam
2. Meghalaya
3. Manipur
4. Arunachal Pradesh

88 Which of the following is the most likely consequence of the introduction of the Nile Perch into Lake Victoria in East Africa?

1.	An increase in the population of native fish species due to a new food source.
2.	A decrease in the diversity of phytoplankton due to competition for resources.
3.	A significant decline in the populations of native cichlid fish species due to predation.
4.	An improvement in water quality due to the filtering activity of the Nile Perch.

89 What is the importance of sacred groves in biodiversity conservation?

1. They are spiritual sites where no biological activity occurs.
2. They serve as reservoirs of rich biodiversity, protecting endemic species.
3. They are used to cultivate medicinal plants using traditional methods.
4. They represent areas where invasive species are cultivated.

90 Consider the given two statements:

I.	Khasi and Jaintia hills are in Meghalaya.
II.	Sarguja, Chanda and Bastar areas are in Maharashtra.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

91 The difference between *ex situ* and *in situ* conservation is:

1. *Ex situ* conservation involves protecting an entire ecosystem in its natural habitat, while *in situ* conservation involves preserving genetic material in gene banks.
2. *In situ* conservation involves protecting an entire ecosystem and its inhabitants in their natural habitat, while *ex situ* conservation involves protecting species by removing part of the population from a threatened habitat and placing it in a new location.
3. *In situ* conservation involves protecting an entire ecosystem and its inhabitants in their natural habitat, while *ex situ* conservation involves protecting species by keeping them in locations such as zoos or botanical gardens.
4. *Ex situ* conservation involves protecting species in their natural habitat, while *in situ* conservation involves research on species in laboratories.

92 Zoological parks and wildlife safari are:

1. in-situ methods for conservation of biodiversity
2. ex-situ methods for conservation of biodiversity
3. always parts of biosphere reserves
4. solitary secluded areas where human movement is forbidden by law

93 What is common to the techniques (i) in vitro fertilization, (ii) Cryo preservation, and (iii) tissue culture?

1. All are in situ conservation
2. All are ex situ conservation methods
3. All require ultra-modern equipment and large space.
4. All are methods of conservation of extinct organisms.

94 The historic convention on Biological Diversity held in Rio de Janeiro in 1992 is known as:

1. CITES Convention
2. The Earth Summit
3. G-16 Summit
4. MAB Programme

95 Consider the given two statements.

Statement I:	The World Summit on Sustainable Development was held in 1992 in Johannesburg, South Africa.
Statement II:	Convention on Biological Diversity, the Earth Summit, was held in 2002 in Rio de Janeiro.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

96 The World Summit on Sustainable Development was held in:

1. 1992 in Rio de Janeiro
2. 1971 in Ramsar
3. 2002 in Johannesburg
4. 1987 in Montreal

BIODIVERSITY AND CONSERVATION - ANSWER KEY

1.	(3)	2.	(1)	3.	(2)	4.	(1)	5.	(1)	6.	(1)	7.	(3)	8.	(2)	9.	(3)	10.	(3)
11.	(1)	12.	(2)	13.	(3)	14.	(4)	15.	(3)	16.	(4)	17.	(1)	18.	(3)	19.	(3)	20.	(1)
21.	(3)	22.	(2)	23.	(3)	24.	(4)	25.	(2)	26.	(4)	27.	(4)	28.	(1)	29.	(4)	30.	(3)
31.	(1)	32.	(3)	33.	(2)	34.	(1)	35.	(1)	36.	(1)	37.	(1)	38.	(4)	39.	(3)	40.	(2)
41.	(1)	42.	(4)	43.	(4)	44.	(1)	45.	(4)	46.	(1)	47.	(2)	48.	(1)	49.	(4)	50.	(2)
51.	(2)	52.	(3)	53.	(4)	54.	(3)	55.	(1)	56.	(1)	57.	(3)	58.	(2)	59.	(4)	60.	(2)
61.	(3)	62.	(2)	63.	(4)	64.	(1)	65.	(4)	66.	(2)	67.	(3)	68.	(1)	69.	(1)	70.	(2)
71.	(3)	72.	(3)	73.	(2)	74.	(1)	75.	(4)	76.	(2)	77.	(4)	78.	(1)	79.	(4)	80.	(1)
81.	(1)	82.	(1)	83.	(1)	84.	(4)	85.	(1)	86.	(1)	87.	(2)	88.	(3)	89.	(2)	90.	(1)
91.	(3)	92.	(2)	93.	(2)	94.	(2)	95.	(4)	96.	(3)								

FAT MCQ's (UNIT VIII, IX & X)

HUMAN HEALTH AND DISEASE

1 Consider the given two statements:

I:	Rhinovirus, the most common virus causing common cold has a tendency to affect the upper respiratory tract.
II:	The mucosa associated lymphoid tissue is not present in the upper respiratory tract.

1. Both **I** and **II** are correct and **II** explains **I**
2. Both **I** and **II** are correct but **II** does not explain **I**
3. **I** is correct and **II** is incorrect
4. Both **I** and **II** are incorrect

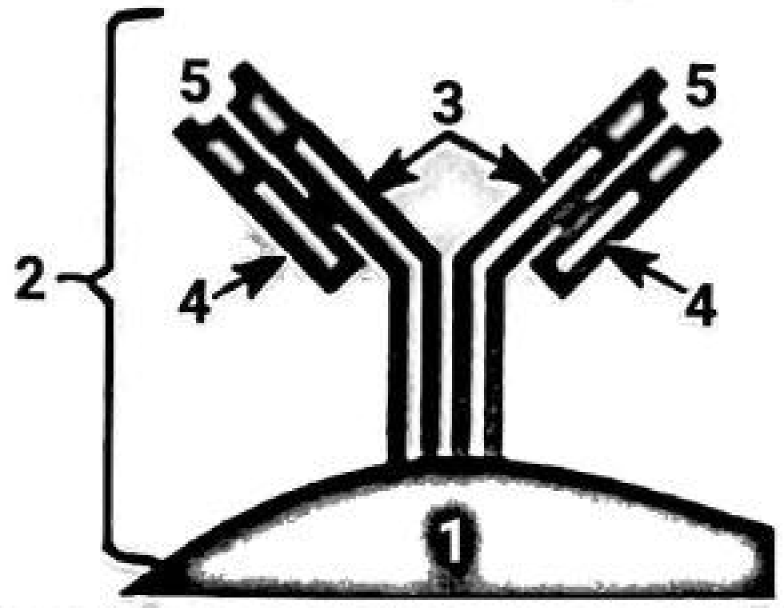
2 Identify the incorrect statement regarding *Entamoeba histolytica:*

1.	Cysts of *Entamoeba* can survive for up to a month in soil or for up to 45 minutes under fingernails.
2.	Invasion of the intestinal lining results in bloody diarrhea.
3.	Infection remains confined to the gastrointestinal tract.
4.	Infections can sometimes last for years if there is no treatment.

3 Fecal-oral route is not involved in the transmission of:

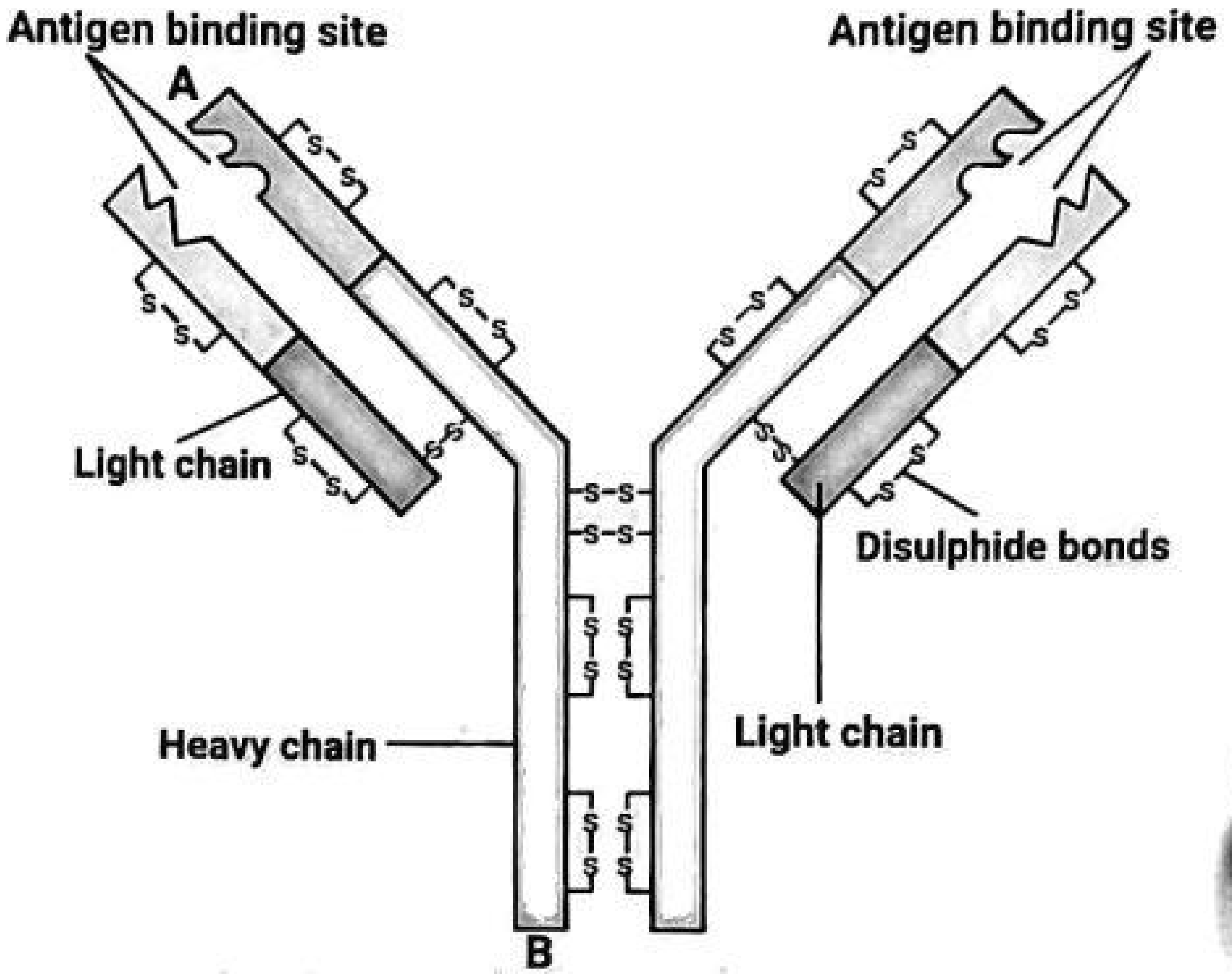
1.	Polio	2.	Amoebic dysentery
3.	Ascariasis	4.	Filariasis

4 The diagram shows the structure of an antibody molecule. Which number shows the antigen binding site?



1.	1	2.	3
3.	4	4.	5

5 In the given diagram, A and B respectively represent:



Structure of an antibody molecule

1.	The N and the C terminus of the polypeptide
2.	The C and the N terminus of the polypeptide
3.	The constant and variable regions of the antibody molecule
4.	The variable and constant regions of the antibody molecule

6 Identify the incorrect statement:

1.	Tetanus is acquired through infection of a cut or wound with the spores of the bacterium *Clostridium tetani.*,
2.	Tetanus can be easily transmitted from person to person.
3.	Tetanus can be prevented through immunization with tetanus-toxoid-containing vaccines (TTCV).
4.	People who recover from tetanus do not have natural immunity and can be infected again.

7 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	If a person is infected with some deadly microbes to which a quick immune response is required as in tetanus, we need to directly inject the preformed antibodies or antitoxin.
Reason (R):	This type of immunization is called passive immunization.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

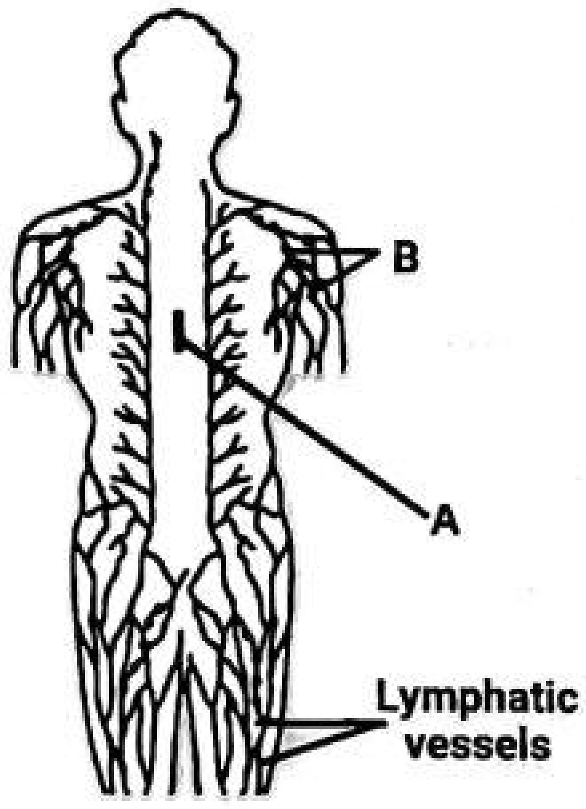
8 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In vaccination, a preparation of antigenic proteins of pathogen or inactivated/weakened pathogen (vaccine) are introduced into the body.
Reason (R):	The vaccines also generate memory – B and T-cells that recognise the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

9 What will be true for the given diagram?



I:	A is thymus and it is a secondary lymphoid organ.
II:	B is MALT and is a primary lymphoid organ.

1.	Only **I**	2.	Only **II**
3.	Both **I** and **II**	4.	Neither **I** nor **II**

10 The correct statements amongst the given are:

I:	The primary lymphoid organs are where immature lymphocytes differentiate into antigen sensitive lymphocytes.
II:	The thymus is quite small at the time of birth and keeps increasing in size with age.
III:	Antigens trapped in the lymph nodes are responsible for the activation of lymphocytes present there and cause the immune response.

1. Only **Statement I** and **Statement II**
2. Only **Statement I** and **Statement III**
3. Only **Statement II** and **Statement** III
4. **Statement I**, **Statement II** and **Statement III**

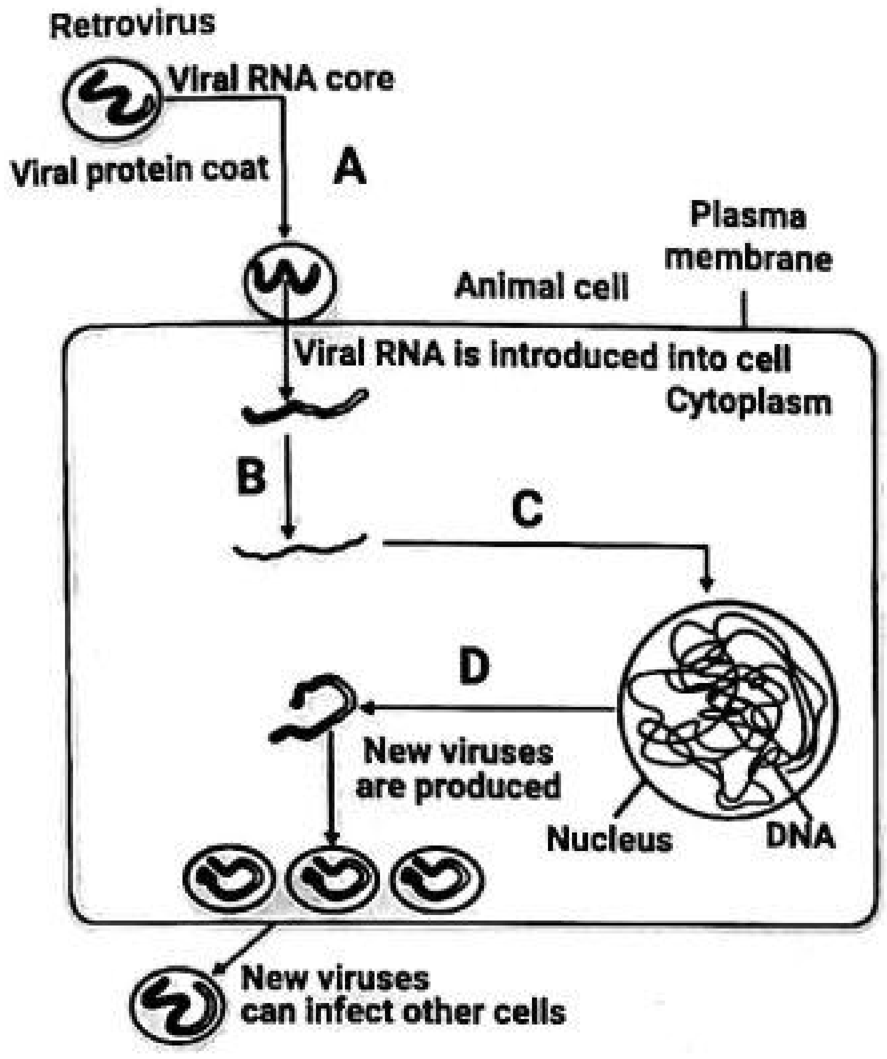
11 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	HIV/Aids infected persons should not be isolated from family and society.
Reason (R):	There is a time-lag of a few months to many years [usually 5-10 years] between infection and the appearance of AIDS symptoms.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False.
2.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	**(A)** is True but **(R)** is False.

12 Study the diagram given and choose the correct statement:


Retrovirus
Viral RNA core
Viral protein coat
A
Plasma membrane
Animal cell
Viral RNA is introduced into cell
Cytoplasm
B
C
D
New viruses are produced
Nucleus
DNA
New viruses can infect other cells

1. A: Retrovirus replicates outside the cell
2. B: Viral DNA is produced by the host's enzyme - reverse transcriptase
3. C: Viral DNA incorporates into the host genome
4. D: New viral DNA is produced by the infected cell

13 The early screening test for HIV infection is :

1. ELISA
2. Western Blot
3. Culture of HIV
4. Detection of opportunistic infections

14 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Early detection of cancer is essential for a favourable prognosis.
Reason (R):	Early detection allows the disease to be treated successfully in many cases.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. Both **(A)** and **(R)** are False.
3. **(A)** is True but **(R)** is False.
4. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

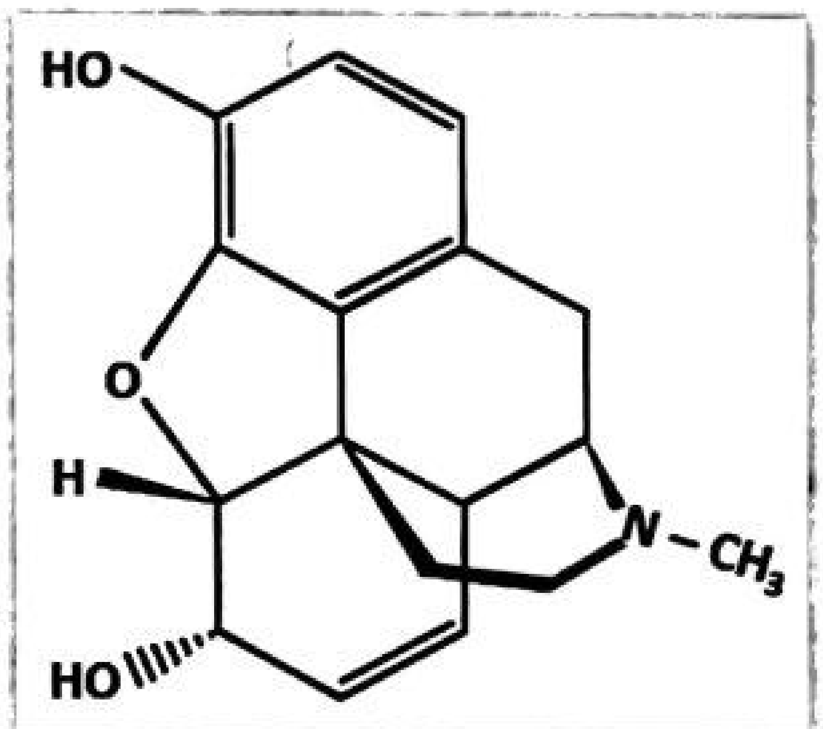
15 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Biological response modifiers like alpha interferon can help detection and destruction of tumour cells by the immune system.
Reason (R):	Such biological response modifiers activate the immune system of the patient.

In the light of the above statements, choose the most appropriate answer from the options given below :

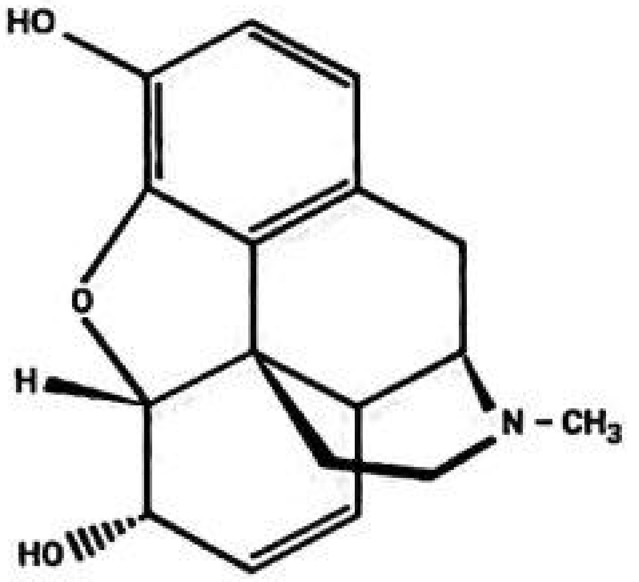
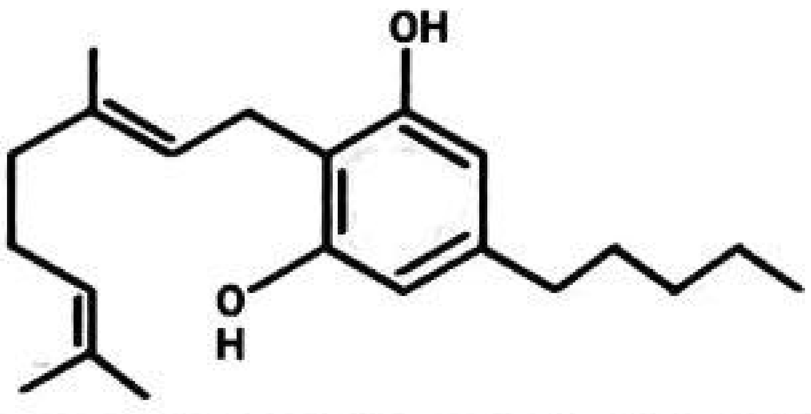
1. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2. Both **(A)** and **(R)** are False.
3. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4. **(A)** is True but **(R)** is False.

16 The receptors for the drug shown below are located in:


HO
O
H
N-CH3
HO

1.	CNS and CVS	2.	CVS and GIT
3.	CNS and GIT	4.	CNS and PNS

17 Identify the molecules (a) and (b) shown below and select the right option giving their source:

(a)	
(b)	

	Molecule	Source	Use
1.	(a) Cocaine	*Erythroxylum coca*	Accelerates the transport of dopamine
2.	(b) Heroin	*Cannabis Sativa*	Depressant and slows down body functions
3.	(b) Cannabinoid	*Atropa belladonna*	Produces hallucinations
4.	(a) Morphine	*Papaver somniferum*	Sedative and painkiller

18 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Adolescence is a very vulnerable phase of mental and psychological development of an individual.
Reason (R):	The period between 12-18 years of age is considered as adolescence period.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4.	Both **(A)** and **(R)** are False.

19 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Smoking causes oxygen deficiency in the body.
Reason (R):	Smoking increases the concentration of haembound oxygen.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

20 Match each item in Column I with one in Column II and select the correct match from the codes given:

	Column I		**Column II**
A.	Addiction	P.	An adaptive state associated with a withdrawal syndrome upon cessation of repeated exposure to a stimulus (e.g., drug intake)
B.	Dependence	Q.	A biopsychosocial disorder characterized by persistent use of drugs (including alcohol) despite substantial harm and adverse consequences
C.	Tolerance	R.	The diminishing effect of a drug resulting from repeated administration at a given dose

Codes:

	A	B	C
1.	Q	R	P
2.	Q	P	R
3.	P	Q	R
4.	P	R	Q

21 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Effects like euphoria and a temporary feeling of well-being are frequent causes of drug addiction.
Reason (R):	Because of the perceived benefits, drugs are frequently used repeatedly.

In the light of the above statements, choose the most appropriate answer from the options given below:

1.	Both **(A)** and **(R)** are False.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

22 It is important to differentiate between drug addiction and dependence. In drug dependence:

1.	cessation of drug use results in an unpleasant state of withdrawal.
2.	there is no possibility of getting rid of the habit.
3.	the presence of drugs in the body leads to positive health benefits.
4.	the tolerance level of receptors in the body for the drug decreases.

23 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

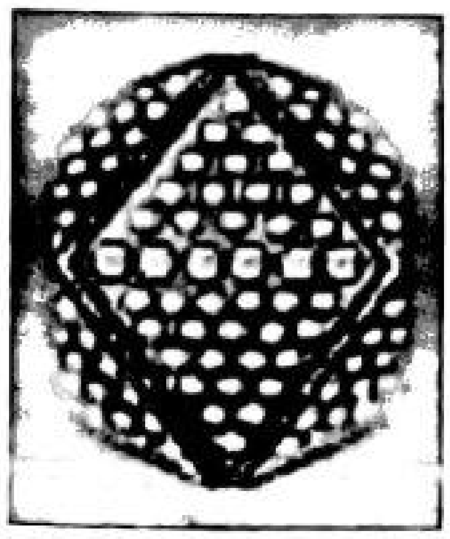
Assertion (A):	Those who take drugs intravenously are much more likely to acquire infections like AIDs and Hepatitis B.
Reason (R):	AIDS and Hepatitis B can be transmitted through infected blood.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

MICROBES IN HUMAN WELFARE

24 The virus shown here is a causative agent of:



1.	Intestinal infections
2.	Respiratory infections
3.	CNS infections
4.	Genito-urinary infections

25 Consider the given two statements:

Statement I:	During growth, the LAB produces acids that coagulate and partially digest the milk proteins.
Statement II:	The dough, which is used for making foods such as dosa and idli is fermented by fungi.

1. Both **Statement I** and **Statement II** are correct
2. Only **Statement I** is correct
3. Only **Statement II** is correct
4. Both **Statement I** and **Statement II** are incorrect

26 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Cyclosporin A is indicated to treat and prevent graft-versus-host disease in bone marrow transplantation and to prevent rejection of kidney, heart, and liver transplants.
Reason (R):	Cyclosporin A lowers the activity of T-cells.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	**(A)** is True but **(R)** is False.

27 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Statins produced by the yeast *Monascus purpureus* have been commercialised as blood-cholesterol lowering agents.
Reason (R):	Statins act by decreasing the absorption of end products of fat digestion in the small intestine.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

28 Given below are the results of three water samples subjected to BOD test:

A	**B**	**C**
BOD 20 mg/l	**BOD 8 mg/l**	**BOD 200 mg/l**

I:	Sample A can be from secondary effluent discharged from an STP.
II:	Sample B can be from a river presumed to be mild to moderately polluted.
III:	Sample C can be from untreated sewage water.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I, II** and **III** are correct

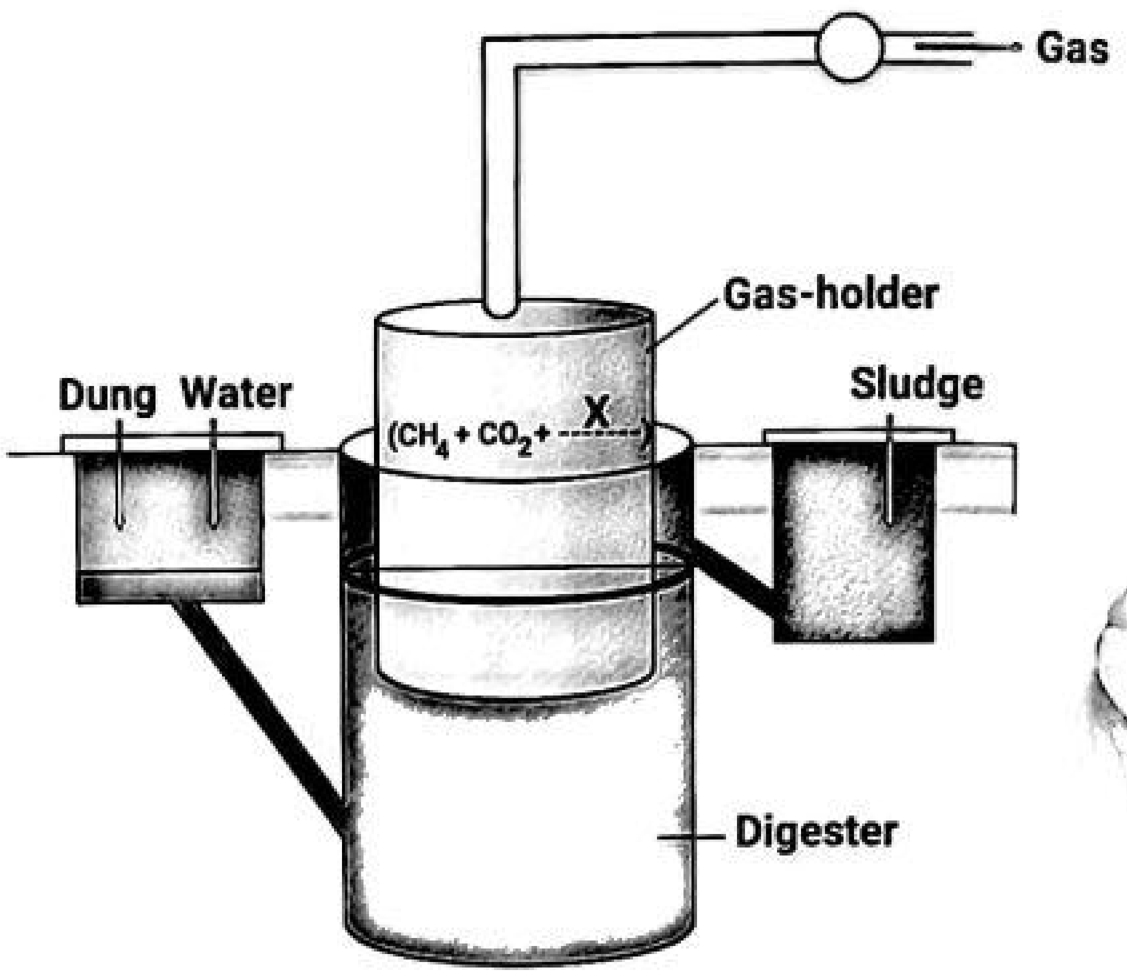
29 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Untreated sewage is often discharged into rivers.
Reason (R):	The sewage contains biodegradable organic matter and does not require any treatment before its release in natural water bodies.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4.	Both **(A)** and **(R)** are False.

30 In the given diagram, the gas X can be:



1.	Hydrogen sulfide	2.	Carbon monoxide
3.	Ammonia	4.	Oxygen

31 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Microbes produce different types of gaseous end-products during growth and metabolism.
Reason (R):	The type of gas produced depends upon the microbes and the organic substrates they utilise.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	Both **(A)** and **(R)** are False.
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

32 Consider the given statements:

Statement I:	Gobar gas is biogas, but not all biogas can be called gobar gas.
Statement II:	Gobar gas strictly refers to cow dung biogas obtained from the anaerobic digestion of cow dung only, however, the final product isn't much different, and gobar gas is usually called biogas by subject matter experts.

1. Both **Statement I** and **Statement II** are correct.
2. Only **Statement I** is correct.
3. Only **Statement II** is correct.
4. Both **Statement I** and **Statement II** are incorrect.

33 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The organic farmer works to create a system where the insects [pests] are not eradicated but kept at a manageable level.
Reason (R):	A key belief of organic farmer is that biodiversity furthers health and the more variety a landscape has, the more sustainable it is.

Choose the most appropriate answer:

1. **(A)** is True but **(R)** is False.
2. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4. Both **(A)** and **(R)** are False.

34 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The organic farmer holds the view that the eradication of the creatures that are often described as pests is undesirable.
Reason (R):	The eradication of the creatures that are often described as pests is not possible.

Choose the most appropriate answer:

1. **(A)** is True but **(R)** is False.
2. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3. Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
4. Both **(A)** and **(R)** are False.

35 Consider the following two statements:

Statement I:	organic farming is a holistic approach that seeks to develop an understanding of the webs of interaction between the myriad of organisms that constitute the field fauna and flora.
Statement II:	An important part of the biological farming approach is to become familiar with the various life forms that inhabit the field, predators as well as pests.

1. Both **Statement I** and **Statement II** are correct.
2. Only **Statement I** is correct.
3. Only **Statement II** is correct.
4. Both **Statement I** and **Statement II** are incorrect.

36 Identify the correct statements:

Statement I:	*Rhizobium* forms symbiotic associations and forms nodules on the roots of non-leguminous plants.
Statement II:	*Azotobacter* and *Azospirillum* can fix atmospheric nitrogen only as symbionts.
Statement III:	*Anabaena*, *Nostoc* and *Oscillatoria* are autotrophic microbes capable of fixing atmospheric nitrogen.

1. Only **Statement I** and **Statement II**.
2. Only **Statement III**.
3. Only **Statement I**.
4. **Statement I, Statement II** and **Statement III**.

BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

37 Identify the correct statements:

I:	In the Cohen and Boyer experiment, the linking of antibiotic resistance gene with a plasmid vector became possible with the enzyme DNA ligase.
II:	Recombinant DNA molecules are DNA molecules formed by laboratory methods of genetic recombination that bring together genetic material from multiple sources, creating sequences that would not otherwise be found in the genome.

1.	Only **I**
2.	Only **II**
3.	Both **I** and **II**
4.	Neither **I** nor **II**

38 Identify the correct statements:

Statement I:	In 1963, two enzymes responsible for restricting the growth of bacteriophage in *E.coli* were isolated.
Statement II:	In 1968, the first restriction endonuclease, that always cut DNA molecules by recognising a specific sequence six base pairs, was isolated and characterised.

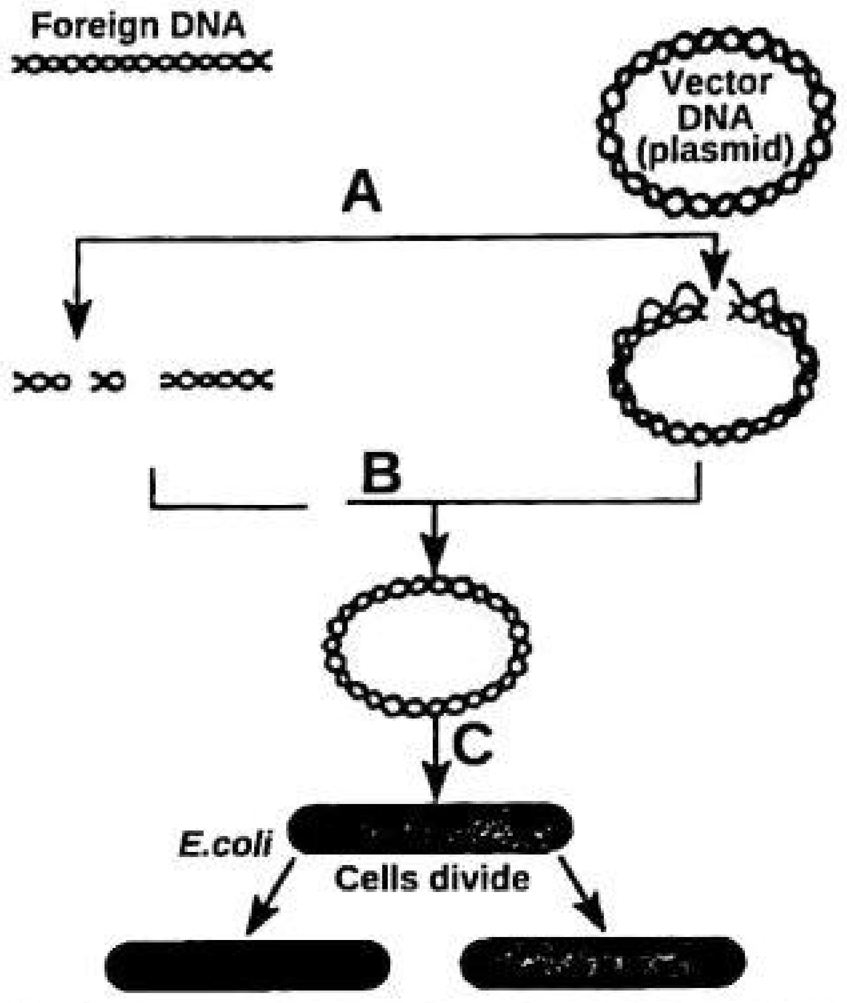
1.	Only **Statement I**
2.	Only **Statement II**
3.	Both **Statement I** and **Statement II**
4.	Neither **Statement I** nor **Statement II**

39 The following palindrome is recognized by the restriction enzyme:

G|A A T T C
C T T A A|G

1.	BamHI	2.	EcoRI
3.	HindII	4.	PstI

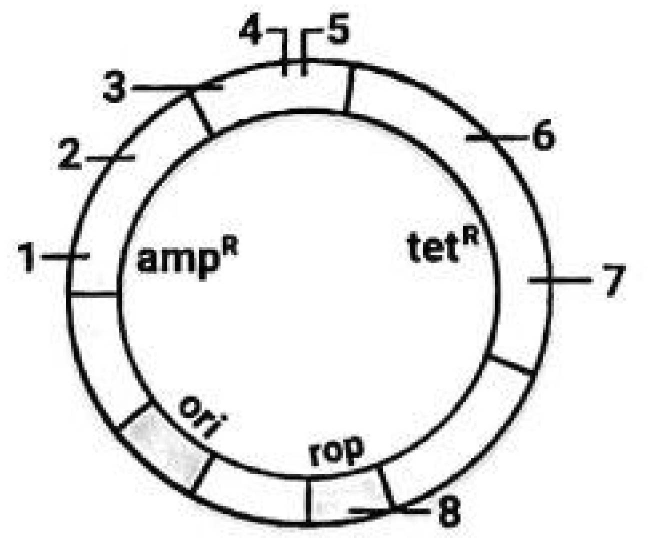
40 What is true regarding A, B and C in the given diagrammatic representation of rDNA technology?



I:	At A, same restriction enzyme is used to cut both foreign and vector DNA
II:	The enzyme used at B is DNA ligase
III:	Step C can be called as transformation

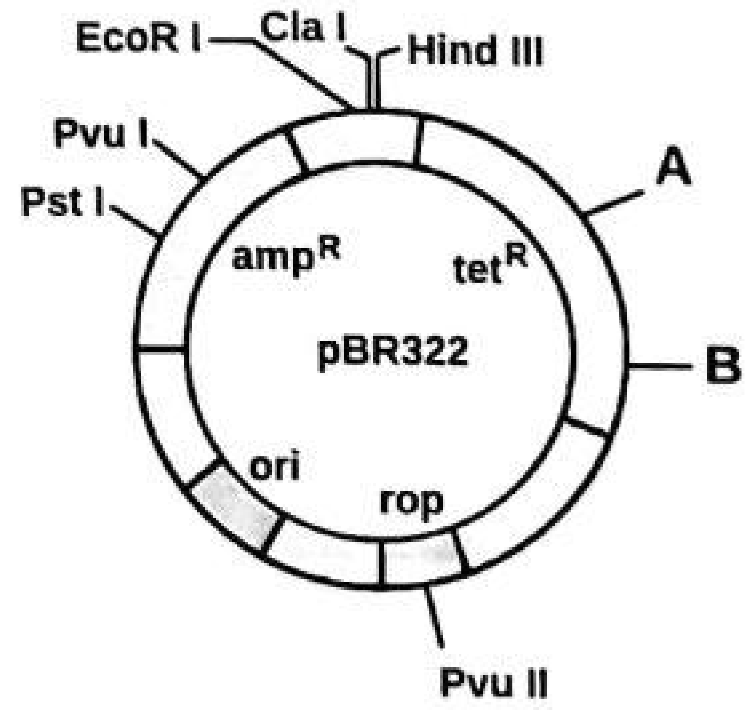
1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

41 In the given diagram of pBR322, the location of the recognition sequences of *BamH I* and *Sal I* are represented by the numbers:



1.	1 and 2	2.	3 and 4
3.	6 and 7	4.	5 and 8

42 A and B in pBR322, shown in the diagram given below, respectively represent recognition sequences of:



1. *BamH I* and *Sma I*
2. *Hind II* and *Sma I*
3. *BamH I* and *Sal I*
4. *Sal I* and *Hind I*

43 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In order to link the alien DNA, the vector needs to have very few, preferably single, recognition sites for the commonly used restriction enzymes:
Reason: (R):	Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4.	Both **(A)** and **(R)** are False.

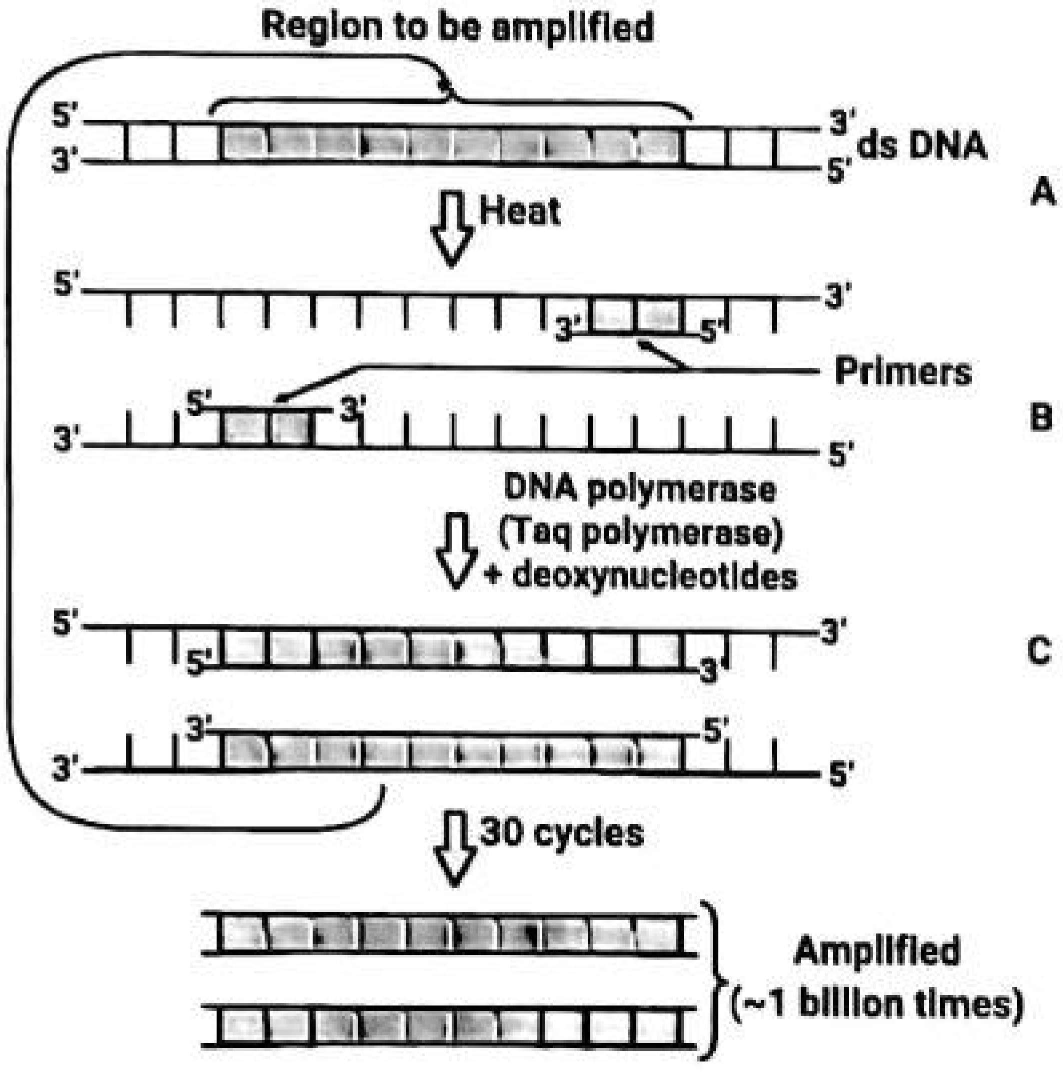
44 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Agar gel electrophoresis is employed to check the progression of a restriction enzyme digestion.
Reason (R):	Restriction enzyme digestion is performed by incubating purified DNA molecules with the restriction enzymes, at the optimal conditions for that specific enzyme.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are False.
2.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

45 What is true about the steps of PCR shown in the diagram given below?



I:	Step A occurs at the temperature of 95 – 98^0 C
II:	Step B occurs at the temperature of 55^0 C
III:	Step C occurs at the temperature of 72^0 C

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I, II** and **III**

46 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	It is possible to select a bacterial cell transformed with a recombinant DNA bearing gene for an antibiotic resistance if the transformed cells are spread on agar plates containing the antibiotic.
Reason (R):	Due to insertional inactivation of the gene for antibiotic resistance gene, only the untransformed bacterial cells will grow and the transformed bacterial cells will die.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are False.
2. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3. **(A)** is True but **(R)** is False.
4. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

47 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	There is a need for the recombinant DNA to be expressed in recombinant DNA technology procedures.
Reason (R):	In almost all recombinant DNA technologies, the ultimate aim is to produce a desirable protein.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are False.
2. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4. **(A)** is True but **(R)** is False.

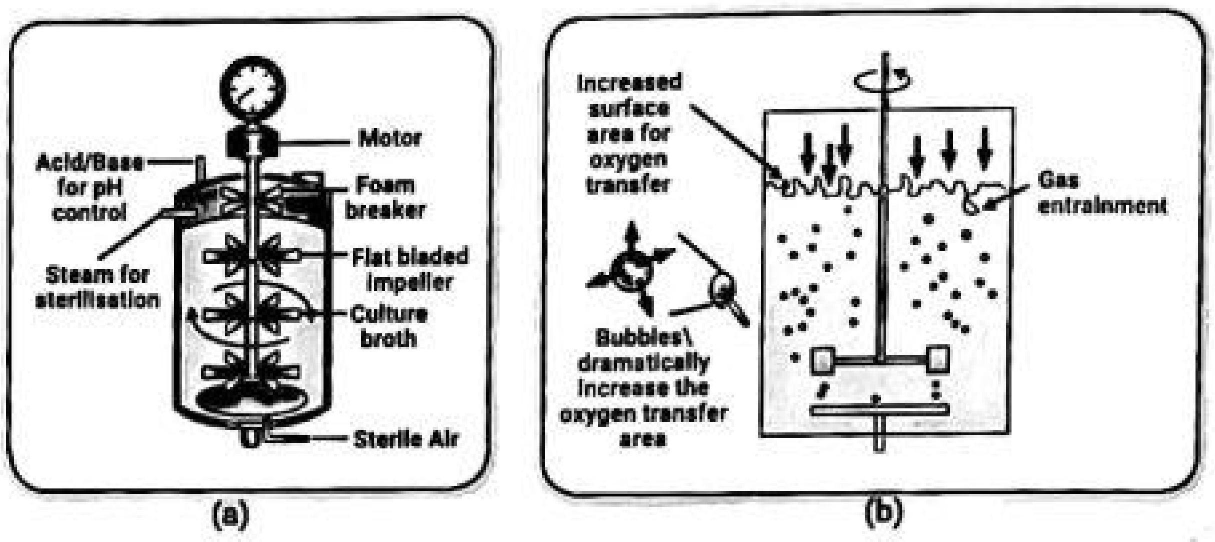
48 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Bioreactors are important in biotechnology procedures to obtain desired products.
Reason (R):	Bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are False.
2. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
3. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4. **(A)** is True but **(R)** is False.

49 Identify (a) and (b) bioreactors respectively in the given diagram:



(a) (b)

1. Simple stirred-tank and sparged stirred – tank
2. Sparged stirred - tank and simple stirred-tank
3. Airlift and tower
4. Tower and airlift

BIOTECHNOLOGY AND ITS APPLICATIONS

50 Consider the two statements:

Statement I:	Use of genetically modified crops is an important option for increasing food production in the future.
Statement II:	Agrochemicals are too expensive for farmers in the developing world.

1. **Statement I** is correct and **Statement II** is incorrect
2. Both **Statement I** and **Statement II** are correct
3. Both **Statement I** and **Statement II** are incorrect
4. **Statement I** is incorrect and **Statement II** is correct

51 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Conventional breeding is not the answer if we want to increase yield in the existing crop varieties.
Reason (R):	The existing crop varieties have evolved into new species and traditional hybridisation is not possible now.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are False.
2. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
3. **(A)** is True but **(R)** is False.
4. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

52 Consider the two statements:

Statement I:	Bt toxin is more environmentally friendly than synthetic pesticides.
Statement II:	Expression of Bt toxin gene in plants provide resistance of certain insects.

1. **Statement I** is correct and **Statement II** is incorrect
2. Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**
3. Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**
4. **Statement I** is incorrect and **Statement II** is correct

53 Consider the two statements:

I:	Any Bt toxin gene isolated from *Bacillus thuringiensis* can be used to create GM crops resistant to all insects.
II:	Bt toxins do not have specificity for any insect groups.

1. **Statement I** is correct and **Statement II** is incorrect.
2. Both **Statement I** and **Statement II** are correct and **Statement II** explains **Statement I**.
3. Both **Statement I** and **Statement II** are correct but **Statement II** does not explain **Statement I**.
4. Both **Statement I** and **Statement II** are incorrect.

54 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In most cases, recombinant therapeutics are safer than similar products isolated from non-human sources.
Reason (R):	Recombinant therapeutics do not induce unwanted immunological responses.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2. **(A)** is True but **(R)** is False.
3. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4. Both **(A)** and **(R)** are False.

55 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Correction of a gene defect by gene therapy involves delivery of a normal copy of gene into the individual or embryo.
Reason (R):	The normal copy of gene delivered takes over the function of and compensates for the non-functional gene.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are False.
2. **(A)** is True but **(R)** is False.
3. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

56 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Deficiency of the enzyme adenosine deaminase causes severe combined immunodeficiency.
Reason (R):	This disorder is caused due to the deletion of the gene for adenosine deaminase.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2. **(A)** is True but **(R)** is False.
3. Both **(A)** and **(R)** are False.
4. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

57 Consider the given statements regarding polymerase chain reaction [PCR] used in molecular diagnosis:

I:	PCR is now used routinely to detect HIV in suspected AIDS patients.
II:	PCR is being used to detect mutations in genes in suspected cancer patients.
III:	PCR can detect infections only when symptoms are present.

1. **Statement I** is correct, **Statement II** is incorrect, **Statement III** is correct.
2. **Statement I** is incorrect, **Statement II** is correct, **Statement III** is correct.
3. **Statement I** is correct, **Statement II** is correct, **Statement III** is incorrect.
4. **Statement I** is incorrect, **Statement II** is incorrect, **Statement III** is correct.

58 Consider the given statements regarding the use of transgenic animals:

I:	Transgenic animals can be specifically designed to allow study of how genes are regulated, and how they affect the normal functions of the body and its development.
II:	Transgenic animals cannot be used to serve as models for humans diseases so that investigation of new treatments for diseases is made possible.
III:	Transgenic animals can be specifically designed to allow study of complex factors involved in growth such as insulin like growth factor.

1. **Statement I** is correct, **Statement II** is incorrect, **Statement III** is correct
2. **Statement I** is incorrect, **Statement II** is correct, **Statement III** is correct
3. **Statement I** is correct, **Statement II** is correct, **Statement III** is incorrect
4. **Statement I** is incorrect, **Statement II** is incorrect, **Statement III** is correct

59 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Transgenic mice are being used to test the safety of polio vaccine.
Reason (R):	Monkeys are not reliable to test the safety of polio vaccine.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are False.
2. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
3. **(A)** is True but **(R)** is False.
4. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

60 Consider the two statements:

I:	Transgenic animals are being used for testing toxicity of drugs.
II:	Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals.

1. **Statement I** is correct and **Statement II** is incorrect.
2. Both **Statement I** and **Statement II** are correct.
3. Both **Statement I** and **Statement II** are incorrect.
4. **Statement I** is incorrect and **Statement II** is correct.

61 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The manipulation of living organisms by the human race cannot go on any further, without regulation.
Reason (R):	Genetic modification of organisms can have unpredictable results when such organisms are introduced into the ecosystem.

In the light of the above statements, choose the most appropriate answer from the options given below :

1. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
2. **(A)** is True but **(R)** is False.
3. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
4. Both **(A)** and **(R)** are False.

62 Consider the two statements:

I:	Most of the developing and underdeveloped world rich financially, but poor in biodiversity and traditio knowledge.
II:	Most of the industrialised nations are rich in biodiversity and traditional knowledge related to bio-resources but poor in biotechnology.

1. **Statement I** is correct.
2. **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

ORGANISMS AND POPULATIONS

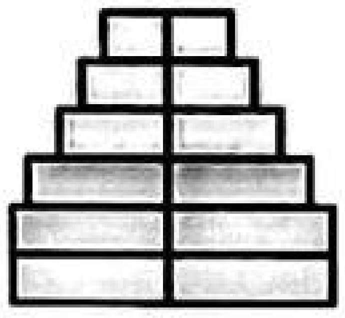
63 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Population ecology links ecology to population genetics and evolution.
Reason (R):	It is at the population level that natural selection operates to evolve the desired traits.

In the light of the above statements, choose the most appropriate answer from the options given below :

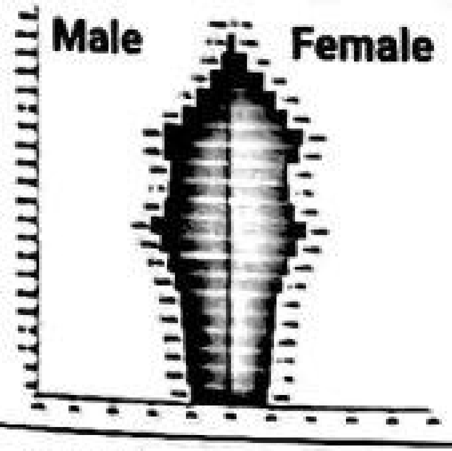
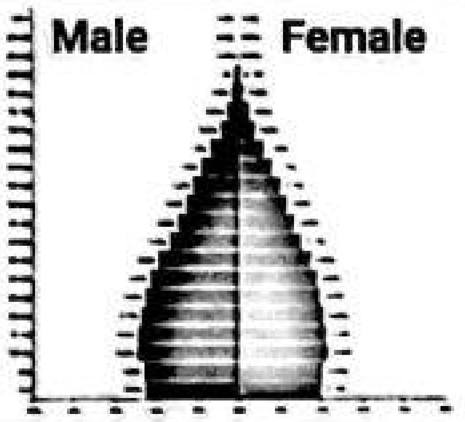
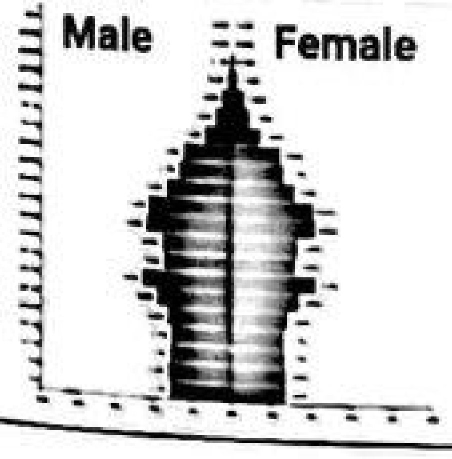
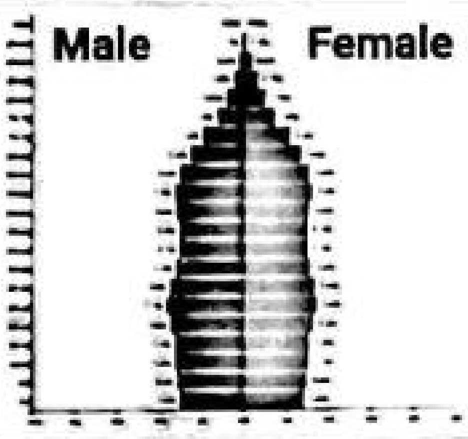
1.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

64 The given age pyramid represents a:



1.	Fast expanding population	2.	Slowly expanding population
3.	Stable population	4.	Declining population

65 Carefully observe the shape of the age-sex population pyramid for four countries. Which of them most likely represents the pyramid for Indian population?

1.		2.	
3.		4.	

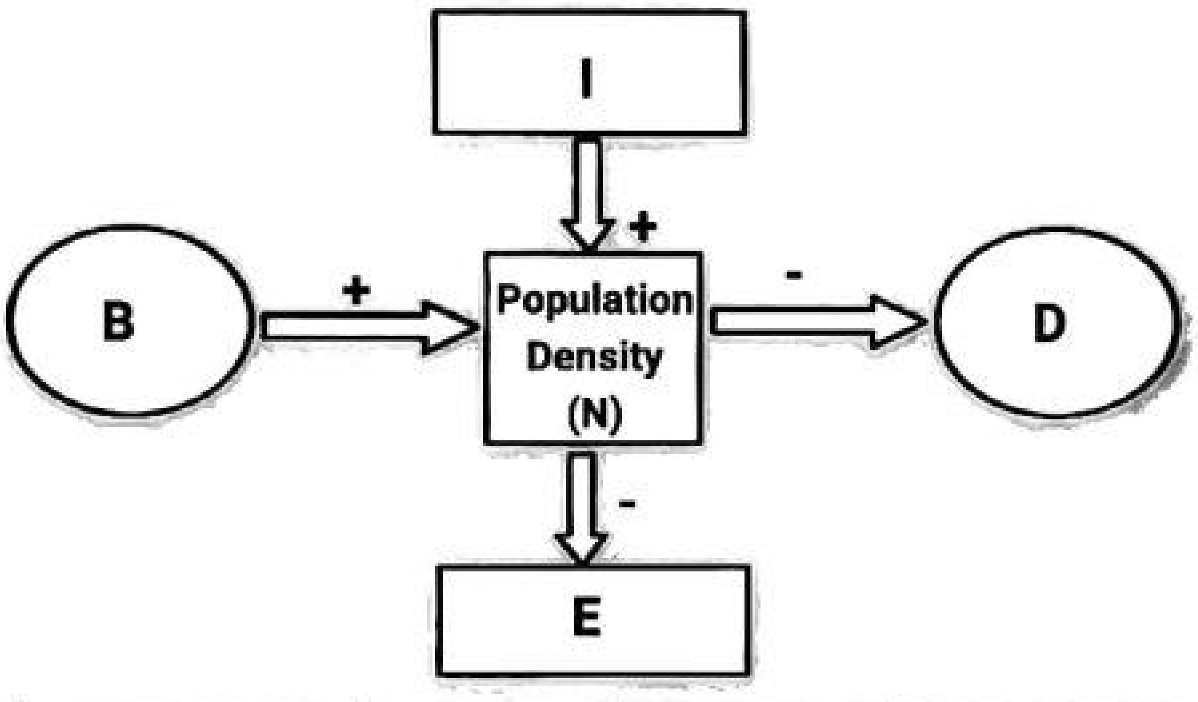
66 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The number of fish caught per trap is not a good measure of its total population density in the lake.
Reason (R):	For ecological investigations, it is obligatory to count every individual in a population to estimate population density.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2.	Both **(A)** and **(R)** are False.
3.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.
4.	**(A)** is True but **(R)** is False.

67 In the given figure, I, B, D and E stand for:



	I	B	D	E
1.	Emigration	Natality	Mortality	Immigration
2.	Emigration	Mortality	Natality	Immigration
3.	Immigration	Natality	Mortality	Emigration
4.	Immigration	Mortality	Natality	Emigration

68 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The logistic growth model is more realistic for most animal populations in nature.
Reason (R):	Resources for growth for most animal populations are finite and become limiting sooner or later in the nature.

In the light of the above statements, choose the most appropriate answer from the options given below:

1.	**(A)** is True but **(R)** is False.
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.

69 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	In every species, there are trade- offs between survival and reproductive traits.
Reason (R):	Natural selection favors traits that improve an organism's chances of survival and reproductive success.

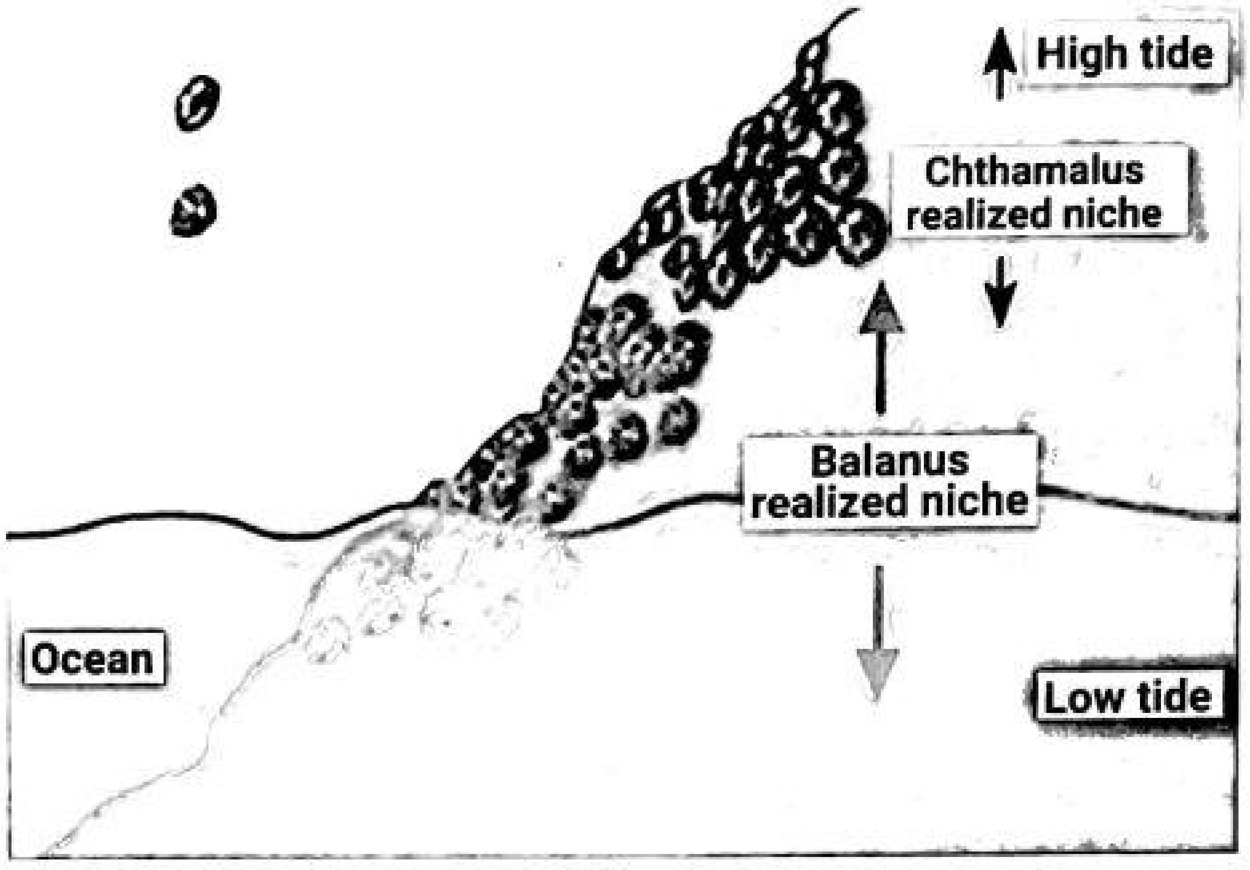
In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

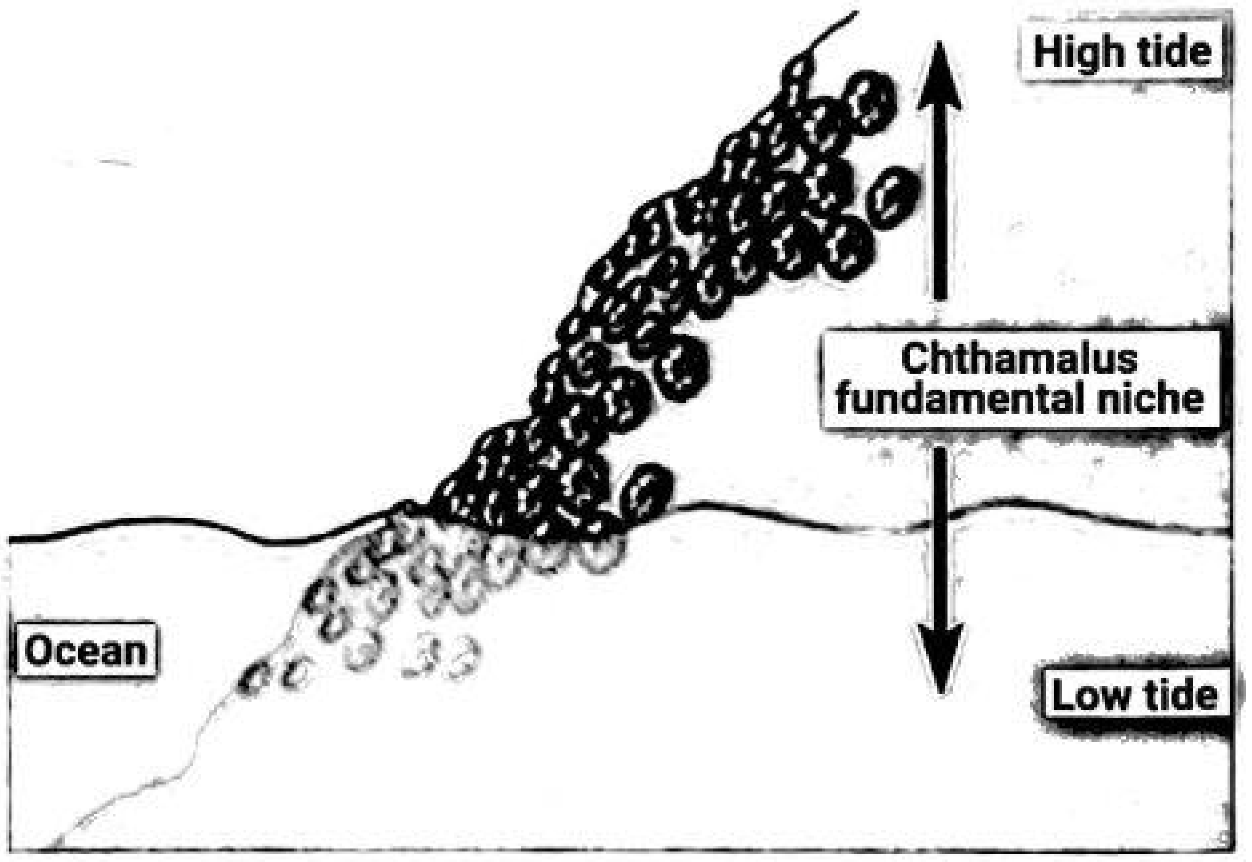
70 The picture below shows the caterpillar of cinnabar moth. The ragwort plants on which the caterpillars feed contain alkaloid poisons. As they eat the leaves, the caterpillars store the poison and this is passed from caterpillar to pupa and finally to the imago/adult. The caterpillars have alternating orange and black bands down their bodies which are highly visible to other organisms. This type of adaptation is called as:

1.	Cryptic colouration	2.	Aposematic colouration
3.	Batesian mimicry	4.	Mullerian mimicry

71 Cornell studied two barnacles – *Chthamalus* and *Balanus*. *Chthamalus* is usually found higher on the rocks. He removed *Balanus* from the rocks at several sites.



The result showed that *Chthamalus* spread into the region formerly occupied by *Balanus*.



The correct conclusion will be:

1.	Interspecific competition makes the realized niche of *Chthamalus* much larger than its fundamental niche.
2.	Interspecific competition makes the realized niche of *Chthamalus* much smaller than its fundamental niche.
3.	Interspecific competition makes the realized niche of *Balanus* much larger than its fundamental niche.
4.	Interspecific competition makes the realized niche of *Balanus* much smaller than its fundamental niche.

72 The number of correct statements amongst the given is:

Statement I:	Parasitism has evolved in many taxonomic groups from plants to higher vertebrates.
Statement II:	Many parasites have evolved to be host-specific and both tend to co-evolve.
Statement III:	All parasites have only one primary and one intermediate host.
Statement IV:	Only a few of the parasites harm their hosts.

1.	1	2.	2
3.	3	4.	4

73 The given picture shows *Cascuta,* commonly found growing on hedge plants. Such relationship is also exemplified by:

I:	Lice on humans and ticks on dogs
II:	Marine fish infested with ectoparasitic copepods
III:	Female *Anopheles* biting human beings
IV:	Tapeworm in the human alimentary canal

1.	Only **I** and **II**	2.	Only **III** and **IV**
3.	Only **I** and **III**	4.	Only **II** and **IV**

74 Consider the two statements given below:

Statement I:	The morphological and anatomical features of endoparasites are greatly simplified but their reproductive potential is very high.
Statement II:	Unlike ectoparasites, endoparasites live inside the host body at different sites and their life cycles are more complex.

1. Only **Statement I** is correct
2. Only **Statement II** is correct
3. Both **Statement I** and **Statement II** are correct
4. Neither **Statement I** nor **Statement II** is correct

75 The given picture shows the symbiotic relationship between an anemone (*Heteractis magnifica*) and a clownfish (*Amphirion ocellaris).*

I:	The anemone provides the clownfish with protection and shelter
II:	The clownfish provides the anemone nutrients in the form of waste while also scaring off potential predator fish

Which of the following options is correct regarding the two statements given above?

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

76 The given picture shows cattle egret and the cattle in close association. This is an example of:

1.	Competition	2.	Commensalism
3.	Mutualism	4.	Parasitism

77 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Plant-animal interactions often involve co-evolution of the mutualists.
Reason (R):	The mutually beneficial system should be safeguarded against 'cheaters'.

In the light of the above statements, choose the most appropriate answer from the options given below :

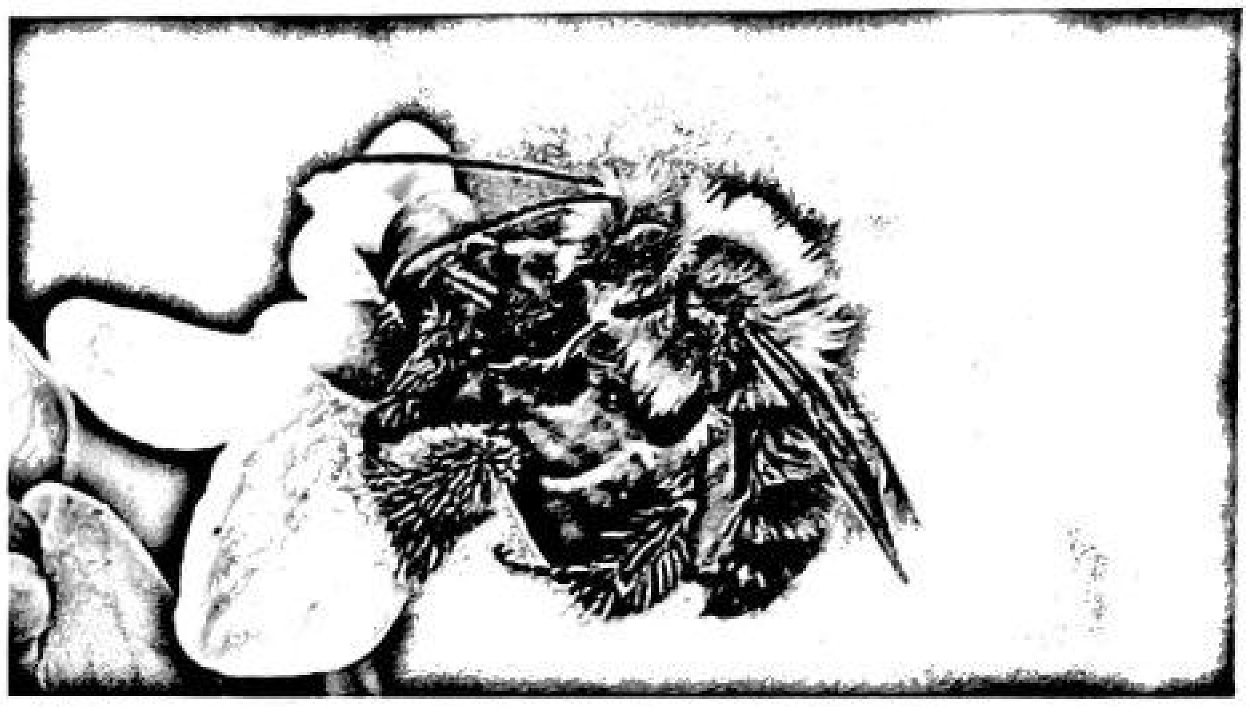
1. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2. Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
3. **(A)** is True but **(R)** is False.
4. **(A)** is False but **(R)** is True.

78 The picture shows mutual relationship between the fig tree and the wasp.

I:	Many species of fig trees can only be pollinated by their 'partner' wasp species and no other species.
II:	The female wasp does not derive any benefit from this relationship.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

79 The picture shows a bee pollinating the Mediterranean orchid, *Ophrys*.



I:	This exemplifies the operation of co-evolution between the bee and the flower.
II:	All orchids offer rewards to their specific pollinators.

1. Both **I** and **II** are correct and **II** explains **I**.
2. Both **I** and **II** are correct but **II** does not explain **I**.
3. **I** is correct but **II** is incorrect.
4. **II** is correct but **I** is incorrect.

ECOSYSTEM

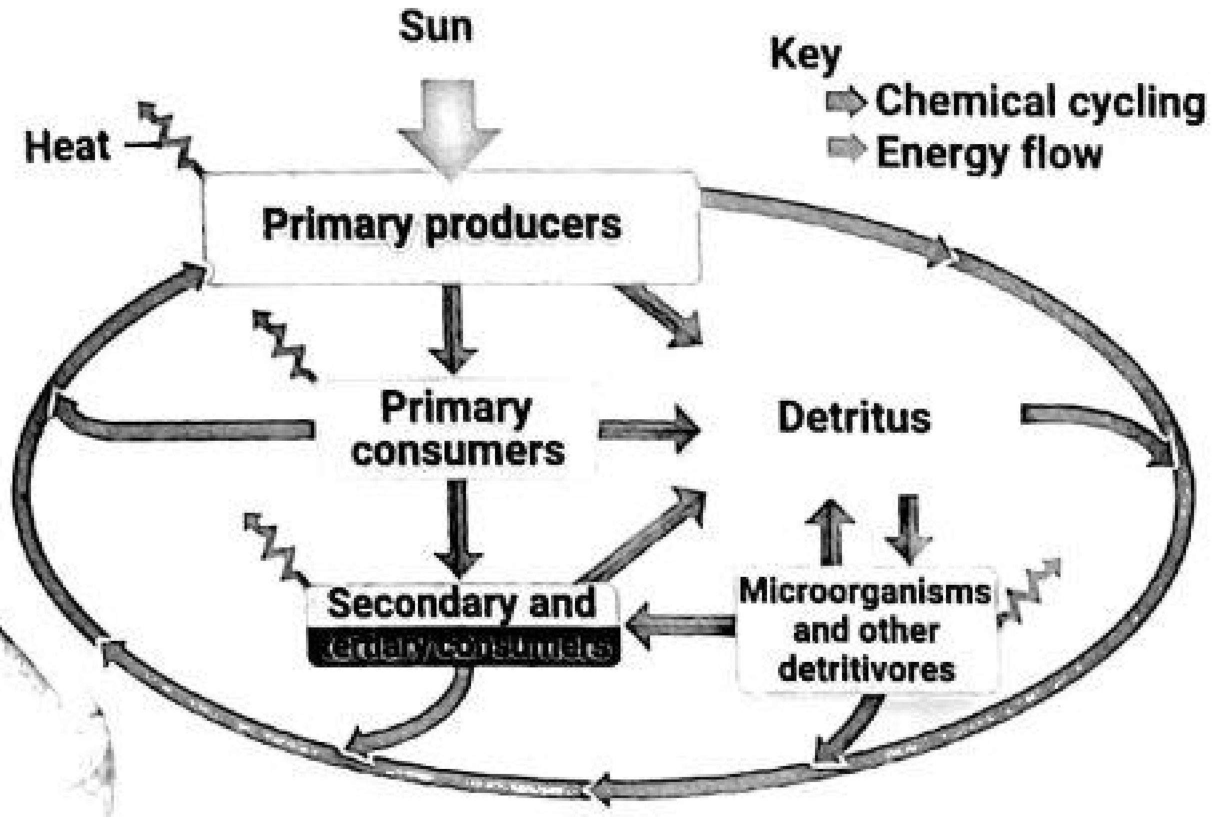
80 Consider the two statements:

Statement I:	Entire biosphere is regarded as a global ecosystem by many ecologists.
Statement II:	The global ecosystem is divided into terrestrial and aquatic ecosystem for convenience.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

FAT MCQ's (UNIT VIII, IX & X)

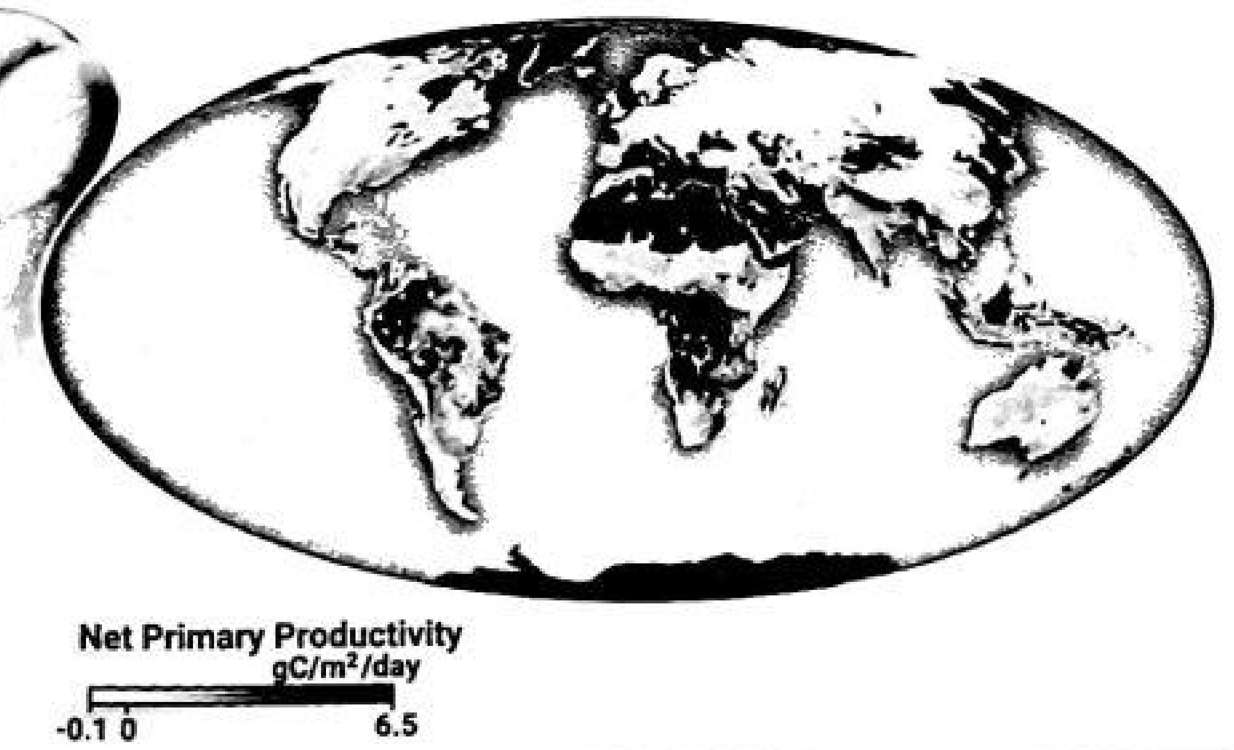
81 Study the given diagram and select the correct statements:



Statement I:	There is unidirectional movement of energy towards the higher trophic levels and its dissipation and loss as heat to the environment.
Statement II:	Nutrients are never lost from the ecosystems, rather they are recycled time and again indefinitely.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

82 Study the given diagram and select the correct statements:



Statement I:	Tropical land areas have the highest rates of production.
Statement II:	Oceans have low productivity.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

83 Consider the two statements:

Statement I:	The terms detritivore and decomposer describe same organisms.
Statement II:	Both are unable to ingest discrete lumps of matter, but instead live by absorbing and metabolizing on a molecular scale.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

84 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Most ecosystems would vanish if the sun were not, continuously, providing energy to the Earth.
Reason (R):	Ecosystems and living organisms defy second law of thermodynamics.

In the light of the above statements, choose the most appropriate answer from the options given below :

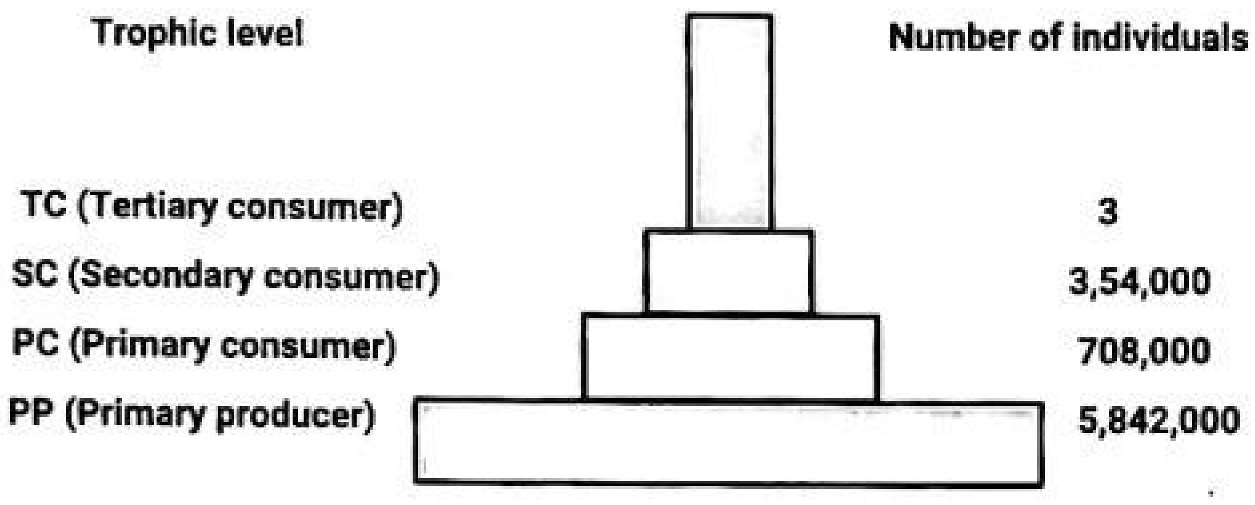
1.	Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2.	**(A)** is True but **(R)** is False.
3.	**(A)** is False but **(R)** is True.
4.	Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

85 Consider the two statements:

Statement I:	No energy that is trapped into an organism remains in it forever.
Statement II:	All animals depend on plants [directly or indirectly] for their food requirements.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

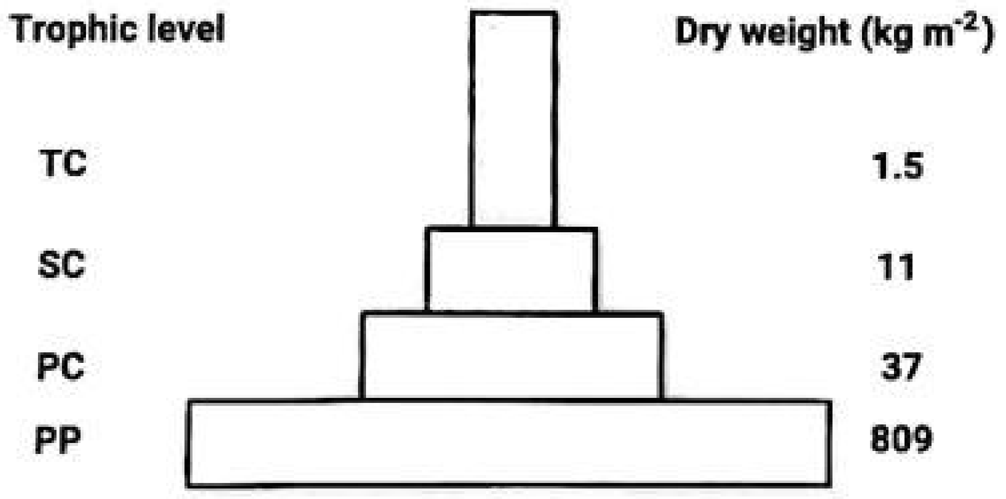
86 The given figure shows pyramid of numbers in a grassland ecosystem. What will be be true for pyramid of numbers?



I:	A pyramid of numbers shows graphically the population, or abundance, in terms of the number of individual organisms involved at each level in a food chain.
II:	The pyramid shows the number of organisms in each trophic level and it does not consider individual sizes or biomass.
III:	It is not necessary that the pyramid is always upright. For example, it will be inverted if beetles are feeding from the output of forest trees, or parasites are feeding on large host animals.

1.	Only I and II
2.	Only I and III
3.	Only II and III
4.	I, II and III

87 The given pyramid of biomass shows a sharp decrease in biomass at higher trophic levels. What can be the reason for this sharp decrease?



I:	The respiration cost increases sharply along successive higher trophic levels.
II:	There can be lower amounts of biomass at the bottom of the pyramid if the rate of primary production per unit biomass is high.

1.	Both I and II are correct and II explains I.
2.	Both I and II are correct but II does not explain I.
3.	I is correct but II is incorrect.
4.	I is incorrect but II is correct.

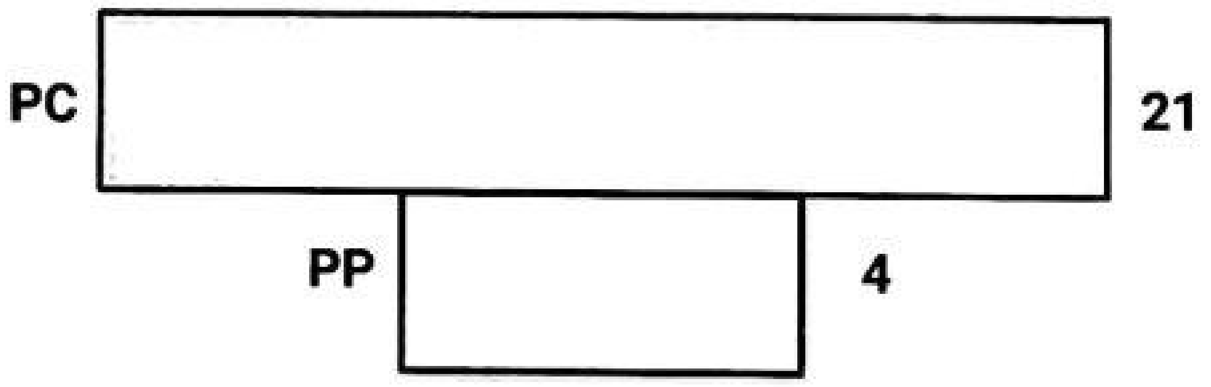
88 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Some aquatic ecosystems have inverted biomass pyramids.
Reason (R):	The pyramid of energy is also inverted in such ecosystems.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

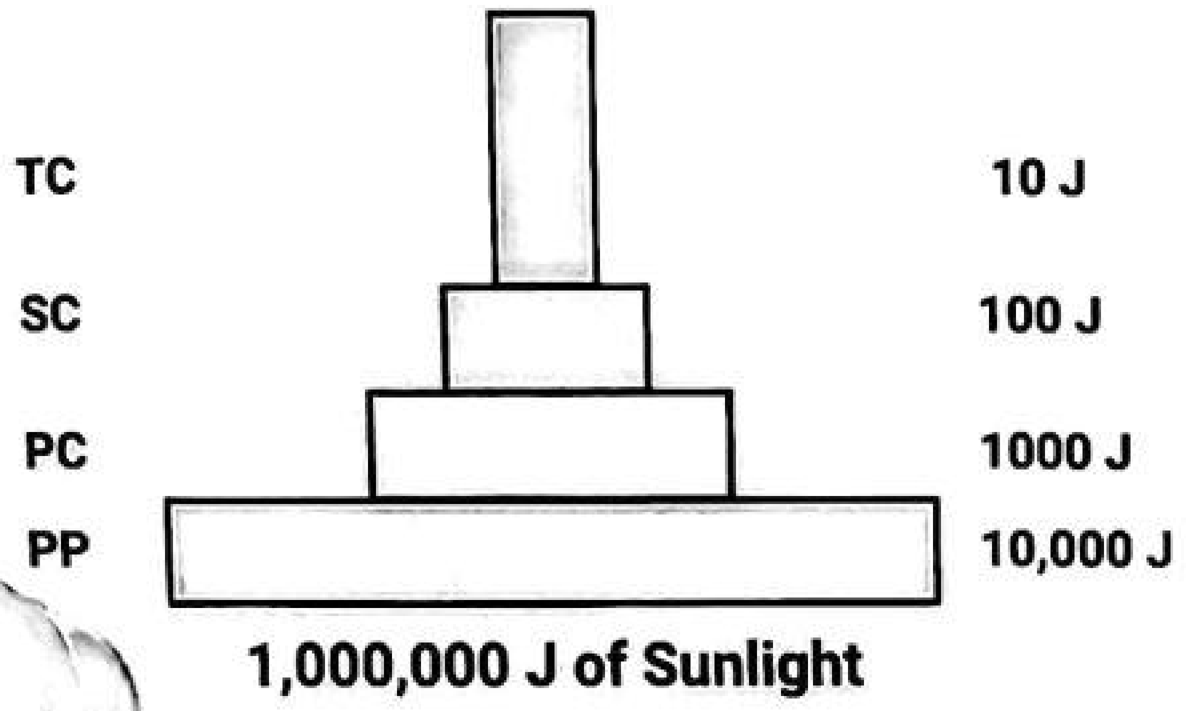
89 The figure shows an inverted pyramid of biomass. What will be true for such a pyramid?



I:	An example of such a pyramid will be the pyramid of biomass in a pond ecosystem, where the standing crop of phytoplankton, the major producers, at any given point will be lower than the mass of the heterotrophs.
II:	The phytoplankton reproduce very quickly, but have much shorter individual lives.

1.	Both **I** and **II** are correct and **II** explains **I**.
2.	Both **I** and **II** are correct but **II** does not explain **I**.
3.	**I** is correct but **II** is incorrect.
4.	**I** is incorrect but **II** is correct.

90 Study the representation of an ideal pyramid of energy in the given figure. Which of the following will be true regarding this pyramid?


TC
10 J
SC
100 J
PC
1000 J
PP
10,000 J
1,000,000 J of Sunlight

1.	The rate of production over a period of time is not taken into account.
2.	Two species of comparable biomass may have very different life spans. Thus, a direct comparison of their total biomasses is misleading, but their productivity is directly comparable.
3.	The relative energy chain within an ecosystem cannot be compared using pyramids of energy; also different ecosystems cannot be compared.
4.	It can be inverted in certain ecosystems.

91 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

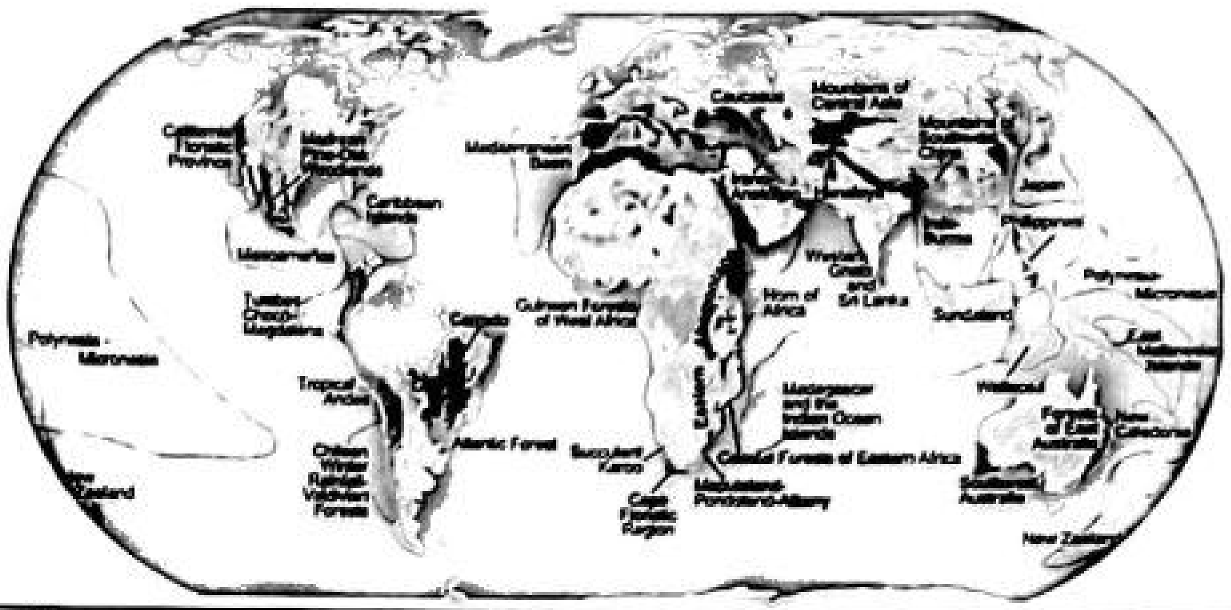
Assertion (A):	Saprophytes play a vital role in the ecosystem.
Reason (R):	Saprophytes are accorded the highest trophic level in a food chain or a food web.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

BIODIVERSITY AND CONSERVATION

92 The map given in the picture below shows:


California Floristic Province
Madrean Pine-Oak Woodlands
Mediterranean Basin
Caucasus
Mountains of Central Asia
Mountains of Southwest China
Caribbean Islands
Irano-Anatolian
Himalaya
Japan
Indo-Burma
Philippines
Mesoamerica
Western Ghats and Sri Lanka
Polynesia-Micronesia
Tumbes-Chocó-Magdalena
Guinean Forests of West Africa
Cerrado
Horn of Africa
Sundaland
Polynesia-Micronesia
East Melanesian Islands
Tropical Andes
Eastern Afromontane
Madagascar and the Indian Ocean Islands
Wallacea
Forests of East Australia
New Caledonia
Atlantic Forest
Succulent Karoo
Coastal Forests of Eastern Africa
Chilean Winter Rainfall-Valdivian Forests
Cape Floristic Region
Maputaland-Pondoland-Albany
Southwest Australia
New Zealand

1.	Location of desert biomes on Earth
2.	Hotspots of biodiversity
3.	Sites of major earthquake disasters in the present century
4.	Places on Earth where the threat to biodiversity is absent

93 The given picture shows the plant *Rauwolfia vomitoria*, a medicinal plant. The genetic variants of this plant in different Himalayan ranges have different concentration and potency of the active chemical reserpine. This type of biodiversity is called as:

1.	Genetic diversity	2.	Species diversity
3.	Ecological diversity	4.	Biosphere diversity

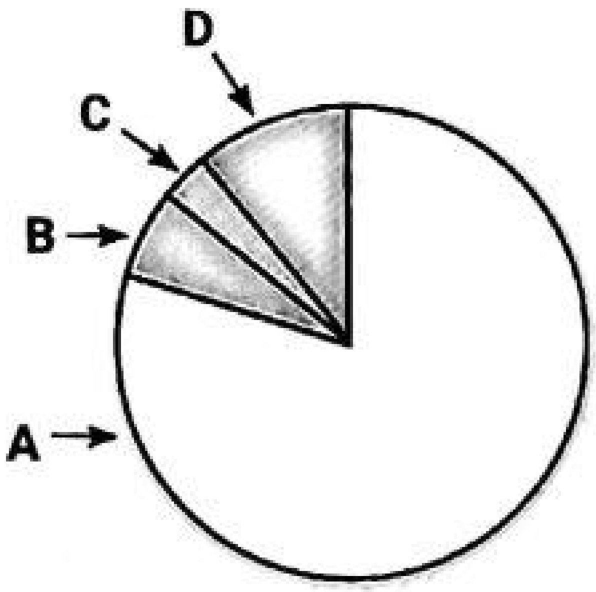
94 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Biologists make a statistical comparison of the temperate-tropical species richness of an exhaustively studied group of insects and extrapolate this richness to other group of animals and plants and come up with a gross estimate of the total number of species on earth.
Reason (R):	Insects are the most successful living organisms among animals and plants.

In the light of the above statements, choose the most appropriate answer from the options given below :

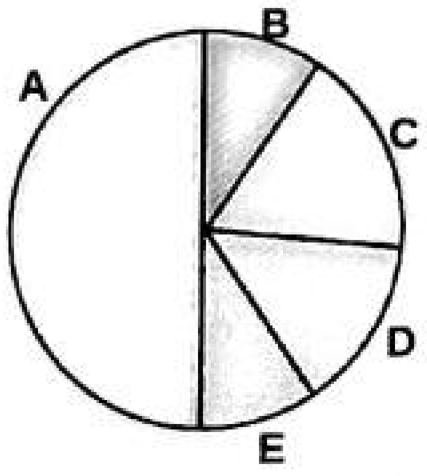
1. Both **(A)** and **(R)** are True but **(R)** does not explain **(A)**.
2. **(A)** is True but **(R)** is False.
3. **(A)** is False but **(R)** is True.
4. Both **(A)** and **(R)** are True and **(R)** explains **(A)**.

95 The following pie chart proportionates the number of species in various invertebrate taxa. A, B and C will represent:



	A	B	C
1.	Insects	Echinoderms	Molluscs
2.	Insects	Molluscs	Crustaceans
3.	Crustaceans	Insects	Molluscs
4.	Molluscs	Crustaceans	Insects

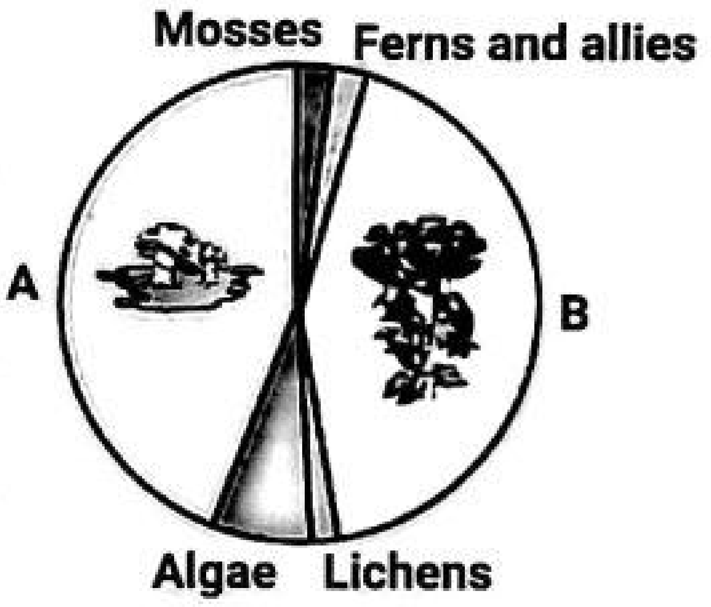
96 The following pie chart proportionates the number of species in various vertebrate taxa. What will be true regarding the animals shown in the pie chart?



Statement I:	'A' group will be of fishes.
Statement II:	'B' and 'C' are endotherms.
Statement III:	'D' are more successful on land than 'E'.

1. Only **Statement I** and **Statement II**.
2. Only **Statement I** and **Statement III**.
3. Only **Statement II** and **Statement III**.
4. **Statement I, Statement II** and **Statement III**.

97 The following pie chart proportionates the number of species in various plant taxa. What will be true regarding the organisms shown in the pie chart?



Statement I:	All members of A are heterotrophs.
Statement II:	The primary reason for the success of B on land is the presence of the reproductive organ, flower.

1. Only **Statement I**.
2. Only **Statement II**.
3. Both **Statement I** and **Statement II**.
4. Neither **Statement I** nor **Statement II**.

98 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Biologists are not sure about how many prokaryotic species there might be.
Reason (R):	A large number of species have not been data based so far.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

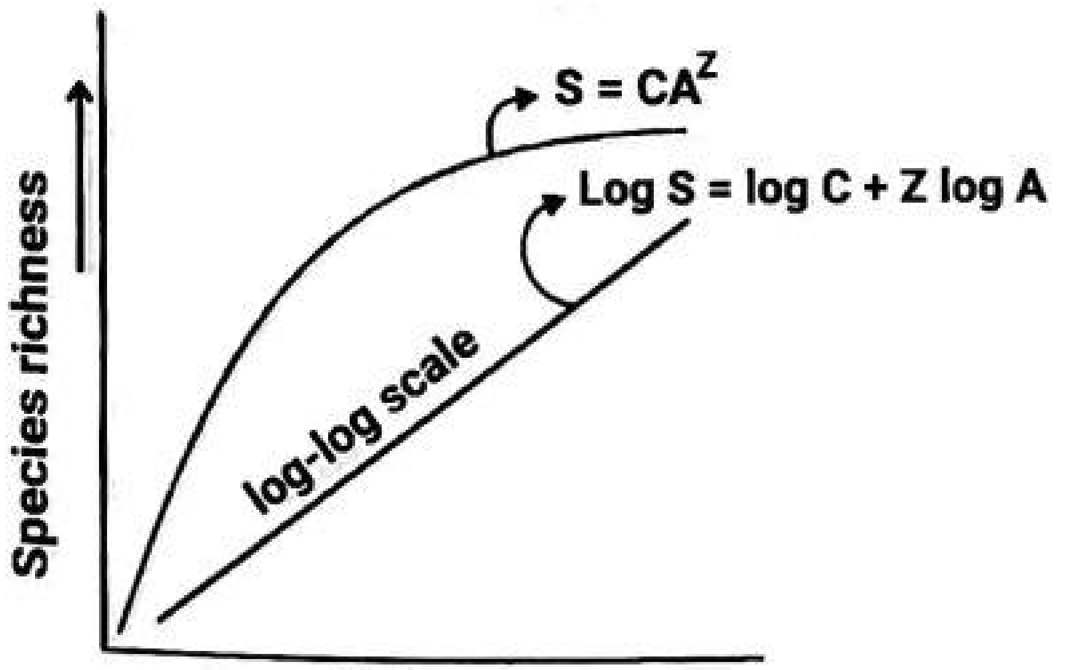
99 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	There is a steady increase in species richness from the arctic to the tropics.
Reason (R):	Seasonal variation is substantially more in tropics than in arctics.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

100 How many of the given statements will be true regarding the graph showing species – area relationship?



I.	Within a region, species richness decreases with increasing explored area.
II.	The rectangular hyperbola represents the relation between species richness and area for angiosperm plants, birds, bats and freshwater fishes, for example.
III.	Z represents the regression coefficient or the slope of the line.
IV.	The value of Z lies in the range of 0.1 to 0.2 regardless of the taxonomic group or the region.
V.	For frugivorous birds and mammals in the tropical forests of different continents, the slope is found to be 1.15.
VI.	If the species area relationship is analysed for very large areas, the slope of the line is much steeper and Z value lies in the range of 0.6 to 1.2.

1.	3	2.	4
3.	5	4.	6

101 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Species diversity contributes to the well-being of an ecosystem.
Reason (R):	Rich biodiversity contributes to higher productivity of an ecosystem.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

102 Match each picture in Table I with the name of the organism in Table II and select the correct match from the codes given.

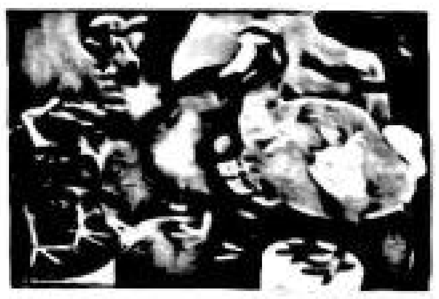
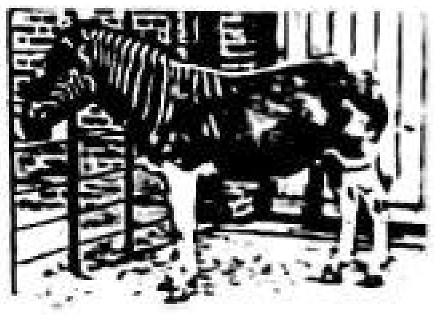
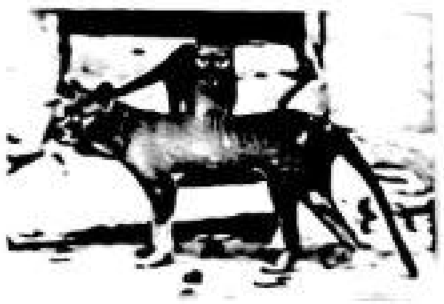
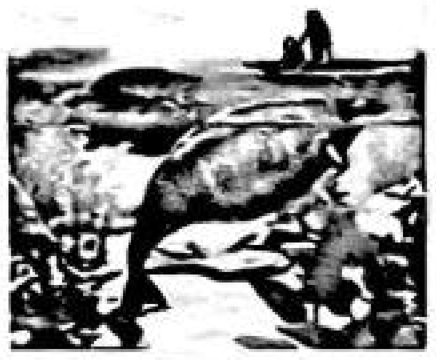
Table I			
A		B	
C		D	

Table II			
P	Thylacine	Q	Dodo
R	Quagga	S	Steller's sea cow

	A	B	C	D
1.	Q	R	S	P
2.	Q	R	P	S
3.	P	Q	R	S
4.	P	S	Q	R

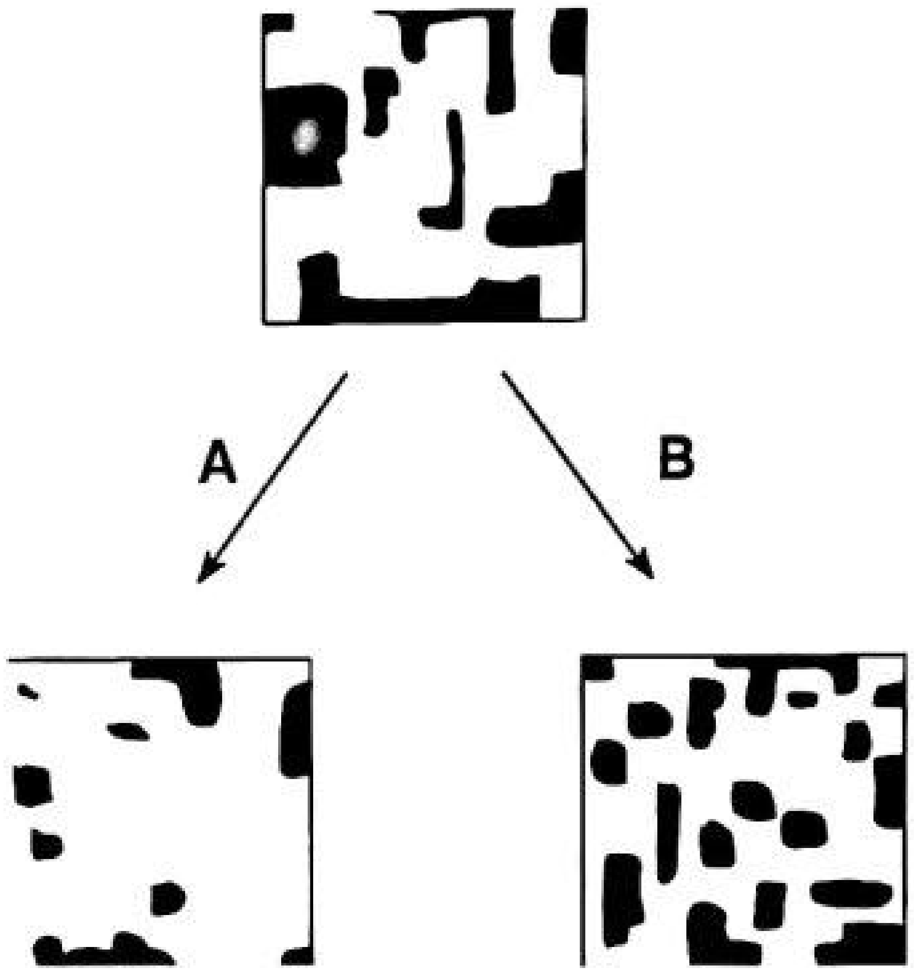
103 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	The current mass extinction is different from the previous episodes of mass extinctions.
Reason (R):	It is happening at a faster rate and is mainly anthropogenic in nature.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

104 The given figure shows one of the most important causes of the loss of biodiversity on Earth.



I:	A is the emergence of discontinuities in an organism's preferred environment (habitat), causing population discontinuities and ecosystem decay.
II:	B is the process by which a natural habitat becomes incapable of supporting its native species.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

105 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Non-native introduced species always have a negative impact on the ecosystem in which they have been introduced.
Reason (R):	Non-native species always become invasive in the introduced ecosystem.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

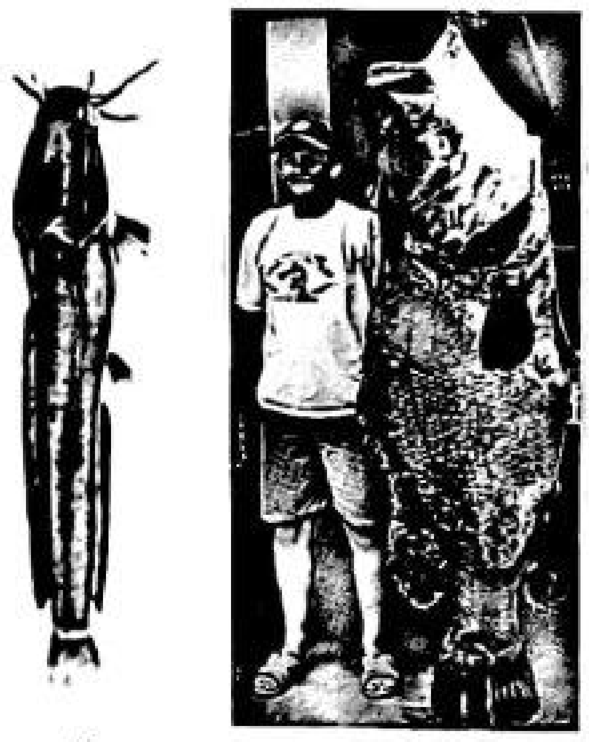
FAT MCQ's (UNIT VIII, IX & X)

106 The beautiful flowers shown in the picture actually belong to a plant infamously called as the 'Terror of Bengal'. What will be true for this plant?

Statement I:	It was always a native of India.
Statement II:	It reproduces very slowly with the help of offset.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect.

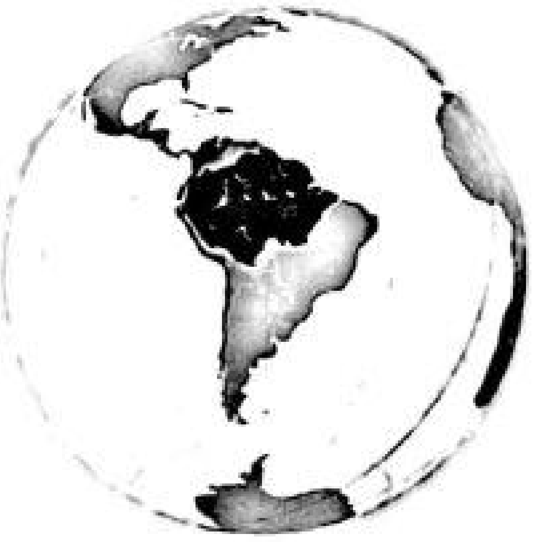
107 Study the given picture and select the correct statements:



Statement I:	A is *Clarias gariepinus* and its introduction in Indian rivers is posing a threat to the indigenous catfishes.
Statement II:	B is Nile perch and its introduction into Lake Victoria in East Africa led to the extinction of an ecologically unique assemblage of more than 200 species of Cichlid fish in the lake.

1. Only **Statement I** is correct.
2. Only **Statement II** is correct.
3. Both **Statement I** and **Statement II** are correct.
4. Both **Statement I** and **Statement II** are incorrect.

108 What will be true for the portion highlighted in green in the map shown?



I:	It is the Amazon rainforest area.
II:	It is called as the 'lung' of planet Earth.
III:	This area is very poor in biodiversity.

1.	Only **I** and **II**	2.	Only **I** and **III**
3.	Only **II** and **III**	4.	**I, II** and **III**

109 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Biosphere reserves attempt to achieve three interconnected functions: conservation, development and logistic support.
Reason (R):	They are legally protected areas where no human activity is allowed.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

110 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Conserving the biological diversity of the ecological hotspots is very important component of efforts to safeguard the world's biological heritage.
Reason (R):	The hotspots of biodiversity cover a large percentage of the land area of earth.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

111 Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A):	Ex-situ conservation, while helpful in humankind's efforts to sustain and protect our environment, is rarely enough to save a species from extinction.
Reason (R):	It is to be used as a last resort, or as a supplement to in-situ conservation.

In the light of the above statements, choose the most appropriate answer from the options given below :

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

112 The given picture shows the Mawphlang Sacred Grove in East Khasi Hills.

Statement I:	These hills are located in the state of Manipur.
Statement II:	They are in-situ method of biodiversity conservation.
Statement III:	Such sacred groves are also found in Aravalli Hills of Rajasthan, Western Ghats of Karnataka and Maharashtra, and the Surguja, Chanda and Bastar areas of Madhya Pradesh.

1. Only **Statement II** is correct.
2. Only **Statement III** is correct.
3. Only **Statement I** and **Statement III** are correct.
4. Only **Statement II** and **Statement III** are correct.

FAT MCQs (Unit VIII, IX & X) - Answer Key

1.	(3)	2.	(3)	3.	(4)	4.	(4)	5.	(1)	6.	(2)	7.	(3)	8.	(4)	9.	(4)	10.	(2)
11.	(3)	12.	(3)	13.	(1)	14.	(1)	15.	(3)	16.	(3)	17.	(4)	18.	(3)	19.	(2)	20.	(2)
21.	(3)	22.	(1)	23.	(3)	24.	(2)	25.	(2)	26.	(2)	27.	(3)	28.	(4)	29.	(1)	30.	(1)
31.	(2)	32.	(1)	33.	(2)	34.	(3)	35.	(1)	36.	(2)	37.	(3)	38.	(3)	39.	(2)	40.	(4)
41.	(3)	42.	(3)	43.	(1)	44.	(2)	45.	(4)	46.	(3)	47.	(2)	48.	(2)	49.	(1)	50.	(2)
51.	(3)	52.	(3)	53.	(4)	54.	(1)	55.	(4)	56.	(1)	57.	(3)	58.	(1)	59.	(3)	60.	(2)
61.	(1)	62.	(4)	63.	(1)	64.	(3)	65.	(2)	66.	(2)	67.	(3)	68.	(2)	69.	(1)	70.	(2)
71.	(2)	72.	(2)	73.	(1)	74.	(3)	75.	(3)	76.	(2)	77.	(2)	78.	(1)	79.	(3)	80.	(3)
81.	(3)	82.	(3)	83.	(4)	84.	(2)	85.	(3)	86.	(4)	87.	(2)	88.	(3)	89.	(1)	90.	(2)
91.	(3)	92.	(2)	93.	(1)	94.	(1)	95.	(2)	96.	(4)	97.	(3)	98.	(2)	99.	(3)	100.	(3)
101.	(2)	102.	(2)	103.	(1)	104.	(4)	105.	(4)	106.	(4)	107.	(3)	108.	(1)	109.	(3)	110.	(3)
111.	(2)	112.	(4)																